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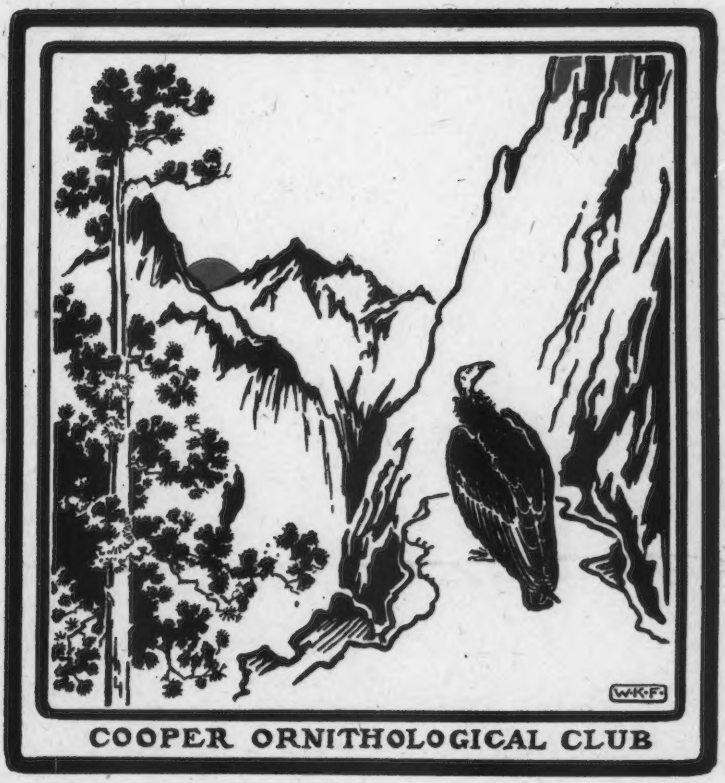
THE CONDOR

A Magazine of Western Ornithology

Volume XXIII July-August, 1921 Number 4



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Volume XXIII **July-August, 1921** **Number 4**

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THE STORAGE OF ACORNS BY THE CALIFORNIA WOODPECKER

By HENRY W. HENSHAW

WITH ONE PHOTO

YEARS AGO when I first visited California my attention was attracted by the antics and behavior of the "carpintero", or California Woodpecker as it is more widely known, and I looked hopefully forward to the time when I should have the opportunity to carefully study the habits of this the most remarkable of our woodpeckers. The looked for opportunity, however, never came, and all I can hope to do at the present time is to add a few desultory notes and gleanings to the very suggestive and interesting account of the storage habits of the bird by Dr. Ritter in THE CONDOR for January, 1921.

Before adverting to the subject proper a few words may be devoted to the general subject of food storing in the animal world by way of comparison with the well known habits of our woodpecker. The storing of food in times of plenty against the hour of need would seem to be a procedure so natural that one can but wonder that it is not more common among animals, especially when we find the habit so well developed in an order as low as the insects. Whole groups of these, as the ants, bees, and wasps, have acquired the practice, and have devised many curious ways, not only of storing food for themselves, but of providing sustenance for their offspring yet unborn.

Passing at a jump from the lower orders to the higher we find that not a few members of the rodent family, the largest of the order, rely upon stored food for their existence a part of the year, and by their thrift and foresight are thus enabled to inhabit regions where otherwise they could not exist. Many of them, however, substitute the practice of aestivation and hibernation to carry them past the seasons of drought and cold, certain of the western ground squirrels and the well known woodchuck of weather-wise fame furnishing examples.

The perishable nature of their food forbids the carnivorous mammals from storing supplies, though we catch a glimpse of the practice in certain of them, as the lion and other cats, which often hide their partly devoured kills with intent to return to them later for further meals.

Turning now to the highly organized group of birds, but one remove from the mammals, we find that very few have developed the storage habit, even to a slight degree, and that most birds are dependent for food upon their daily

toil. The majority of them, indeed, lead a "hand to mouth" existence and spend most of their waking hours in the never ending quest for sustenance for themselves and their offspring. In the cold and temperate zones, when the food supply begins to fail, most of them depart for regions where food is plenty and never failing. In their constant struggle for life their wings confer upon birds a great advantage over their less mobile cousins, and it is of interest to note that the bats, the only family of mammals that has developed the power of flight to the point that vies with birds, has also adopted the habit of migration, and, with rare exceptions, the several species leave the colder regions for more tropical ones.

The most conspicuous example among birds of a food storer is the California Woodpecker, under which name for the purposes of this paper are included the "Ant-eating Woodpecker" of our southern border and Mexico, and the "Narrow-fronted Woodpecker" of Lower California. All these are but subspecies of *Melanerpes formicivorus*.

In early November of 1884, while conducting linguistic researches among the California Indians, I visited the town of Los Alamos, having found there an old Indian who formerly lived on Santa Rosa Island, and who was one of the last survivors of his tribe, if not the last. My daily walks morning and afternoon to where he lived on the outskirts of the town carried me through a grove of scattered oaks, and here I had an excellent, though brief, opportunity to observe a colony of woodpeckers storing away acorns in holes already drilled in the dead branches of the oaks.

Here for the first and only time I saw the birds pick up pebbles from the ground, and insert them in the holes as a substitute for acorns. This apparently nonsensical departure from the acorn storing habit is by no means entirely devoid of significance, and forms an interesting example of a useful habit gone wrong. The explanation of the substitution of pebbles for acorns seemed to me at the time to be simple enough; nor do I see any present reason to change my view. California is remarkably well supplied with oaks, and the valleys, foothills, and mountains each have their own species. Nevertheless not every year is an acorn year, and some seasons the supply of mast is very small indeed, or altogether wanting. It chanced that there was a very poor crop that year about Los Alamos, and, acorns being for the most part wanting, the birds took the readiest substitute. The storage habit developed through thousands of years has now become imperative, and, as the birds have to store something in the holes already suggestively prepared, they take the most convenient substitute, quite oblivious of the fact that the stones have no food value nor, indeed, any value whatever to the storer, except that arising from the pleasure of storing them, which will be adverted to later. Probably not many stones are thus laid away as compared to the number of acorns, but, as the birds have no further interest in them, they remain where placed till in the lapse of years they weather out and fall to the ground.

The practice of storing stones in the holes dug for the reception of acorns is by no means a local one. Other observers, as quoted by Dr. Ritter, have noted the habit in widely separated localities, both in our own territory and Mexico. Thus C. R. Orcutt contributed to *Science* of March 14, 1884, a note stating that 75 miles south of the boundary, in Mexico, at an altitude of 6000 feet, he observed "the bark of pines perforated with holes" in about one-third

of which were acorns; in the rest were bits of granite gravel of size corresponding with the acorns in the other holes. This was unmistakably the work of our woodpecker, and the unusual percentage of stones would seem to indicate either the work of years or to point to several recent bad acorn seasons.

It is interesting to note that the habit of this woodpecker of storing food is not confined to the temperate zone but accompanies the species to its tropical habitat where food abounds and there would seem to be no adequate reason for it. Thus it is stated in the Proceedings of the Zoological Society (p. 14, 1876), that Mr. O. Salvin exhibited and made remarks on the section of the trunk of a pine from Guatemala perforated by a woodpecker (*Melanerpes formicivorus*) "for the purpose of storing acorns".

De Saussure* also states that in the desert near Cafre de Perote, Vera Cruz, Mexico, *Colaptes cafer* [Red-shafted Woodpecker] bores holes into dead agave stalks through which it inserts acorns into the hollow interior of the stalk. The birds begin the holes near the bottom and fill up the entire stalk. The storing of this food for consumption later in the winter must be important in woodpecker eyes, since the acorns were brought from a considerable distance from the mountains where alone the oaks grow. This account tallies so well with the habits of the California Woodpecker and is so unlike the known habits of *Colaptes* that I am led to raise the question whether or not the bird was that species and not the red-shafted one. At all events the birds were woodpeckers, and they appear to have hit upon a safe place of deposit which argues well for their intelligence.

While I do not doubt that the acorn-storing habit is based on the more or less definite intent to provide food for future use, the faulty methods employed and the imperfect results obtained show that as yet the birds have only imperfectly learned their lesson. Thus when the acorn season arrives the birds do not systematically proceed to fill all the available holes and then make others as needed, but dig holes at any and all seasons as they have leisure or feel inclined. The result is that the supply of holes in a locality usually far exceeds the number of acorns stored, with a corresponding waste of energy and lack of foresight.

In searching for the motives underlying the storing habit of the California Woodpecker we should not lose sight of the fact that the several acts in the process, the boring of the holes, the search for the acorns, the carrying them to the holes and the fitting them in, bear no semblance to work in the ordinary sense of the term, but is play. I have seen the birds storing acorns many times, and always when thus engaged they fill the air with their joyous cries and constantly play tag with each other as they fly back and forth. When thus engaged they might not inaptly be likened to a group of children at play.

In further illustration of the play habit of this woodpecker it is to be noted that its bill, as in the case of others of its tribe, is wonderfully well adapted to digging into wood, and it is as natural for the bird in its idle moments to dig just for the fun of it as it is for the boy to whistle or the proverbial Yankee to whittle a stick. I have many times observed the Downy and the Hairy Woodpecker drilling holes in sound trees with no apparent purpose unless to occupy an idle moment. I have also noticed in Maine live fir trees in the trunks of which several inches of bark and wood had been dug out by the

*Observations sur les Moeurs de Divers Oiseaux des Mexique, 1858.

Pileated Woodpecker for no apparent reason, and I am constrained to the opinion that in such cases amusement has much, if not everything, to do with the act. So, too, it appears to be when the Hairy Woodpecker beats a tattoo on a dry resonant limb, a very pleasant musical sound even to human ears, with no apparent object in view save the fun of making a noise or perhaps occasionally signalling to some distant mate. We may note in passing that one result of this play habit, though probably not anticipated by the bird, is to keep the bill and the muscles connected with it in serviceable condition for the more serious labor of digging out larvae from the wood.

The California Woodpecker is not the only one of our birds that has glimpsed the advantage of storing food against the time of need, as witness the impaling of mice, small birds, and insects on thorns or in the forks of branches by the shrike. In the case of this bird, however, the habit, not a frequent one I think, is more often than not unavailing, since the bird more often than not fails to profit by its foresight in any way, either forgetting all about its stores, or, perhaps, wandering too far away to make it worth while to return to them. In any event the usefulness of the habit to the bird must be very small, and is, perhaps, to be viewed as a habit in the very early stages of its birth. In this connection one is tempted to ask why other woodpeckers, particularly the Red-head, which is a mast eater and in many of its habits strongly resembles the "Carpintero", have not hit upon the device of storing food, as, in fact, some of them have while others have not. Thus Merriam* tells us that in the Adirondack region the Red-head winters or not according to whether it is or is not a beech-nut year. It would thus appear then that the Red-head of the Adirondack region has not acquired the habit of storing away beech nuts, and so far as my own observations about Washington go, as also those of other observers, the Red-head never stores away food of any kind but depends upon what it can obtain from day to day. When this fails it accepts the alternative of migration and departs for regions where supplies are more readily obtainable. Nevertheless the Red-head in certain localities does store away food, apparently habitually.

Much to the point are the observations in central Indiana made and recorded by O. P. Hay in the *Auk*, 1887, p. 193, which show the Red-head as an active hoarder of food. They are so interesting that I quote them almost verbatim.

> From the time the nuts [beech nuts] began to ripen, these birds appeared to be almost constantly on the wing passing from the beeches to some place of deposit. They have hidden away the nuts in almost every conceivable situation. Many have been placed in cavities in partially decayed trees; and the felling of an old beech is certain to prove a little feast for a bevy of children. Large handfulls have been taken from a single knot-hole. They are often found under a patch of the raised bark of trees, and single nuts have been driven into the cracks in bark. They have been thrust into the cracks in front gate-posts; and a favorite place of deposit is behind long slivers on fence posts. I have taken a good handfull from a single such crevice. . . . In a few cases grains of corn have been mixed with beech-nuts, and I have found also a few drupes apparently of the wild-cherry and a partially-eaten bitter-nut. The nuts may often be seen driven into the cracks at the ends of railroad ties; and, on the other hand, the birds have often been seen on the roofs of houses, pounding nuts into the crevices between the shingles. In several instances I have observed that the space formed by a board springing away from a fence-post, has been nearly filled with nuts,

*Remarks on Some of the Birds of Lewis County, Northern New York, Bull. Nuttall Orn. Club, July 1878, p. 123.

and afterwards pieces of bark and wood have been brought and driven down over the nuts as if to hide them from poachers. . . . An examination recently of some of these caches showed that the nuts were being attacked by animals of some kind. The Red-heads are frequently seen in the vicinity of these stores and they sometimes manifest great impatience at the presence of other birds.

It may be added that observation clearly showed that the stored nuts were subsequently used for food.

Another instance of the storage of food by the Red-head was published in Bull. Nuttall Orn. Club, April, 1878, p. 97, by Mr. H. B. Bailey, being an extract from a letter received from Mr. G. S. Agersborg of Vermilion, Dakota, as follows:

Last spring in opening a good many birds of this species (*Melanerpes erythrocephalus*) with the object of ascertaining their principal food, I found in their stomachs nothing but young grasshoppers. One of them, which had its headquarters near my house, was observed making frequent visits to an old oak post, and on examining it I found a large crack where the woodpecker had inserted about one hundred grasshoppers of all sizes (for future use, as later observations proved), which were put in without killing them, but they were so firmly wedged in the crack that they in vain tried to get free. I told this to a couple of farmers, and found that they had also seen the same thing, and showed me the posts which were used for the same purpose.

In respect of this habit of storing away live prey for future use the Red-heads of Dakota are unique, and I know of no exact parallel to it.

I have received the following interesting note from Miss Marion J. Pellew on the habits of the Red-head in South Carolina, which not only shows that the local woodpeckers there are storers of food but that their method results in considerable damage to property.

About Aiken, South Carolina, the Red-headed Woodpeckers are very abundant, and are very common in the town. As soon as the poles carrying electric wires begin to show cracks, the birds begin stuffing the cracks with acorns which are hammered in. An official of the electric light and power company of Aiken states that the company sustains an annual loss of several thousand dollars due to the operations of these woodpeckers, both from the drilling of holes, and from the rotting of the wood caused by the storing of the acorns.

Miss Pellew further states that she noticed that the board along the ridge pole of her house was curling up, and on investigation it was found that under this board for a distance of from 8 to 10 feet from the eaves were decayed and half decayed acorns to a depth of at least 1 inch, and a friend of hers had the same experience.

It is well known that the Red-heads dispossess other birds of their nesting sites in the holes of trees, and even destroy their eggs and kill their young; but the following observation by Bendire given in his "Life Histories" is in some respects unique. He saw a Red-head eat part of a young bird, probably a bluebird, and store away the remainder "behind the loose bark of an oak post". This was in Holland Patent, New York. Visiting the place the following morning, he found that the remains were gone and, though definite proof was wanting, he inferred, probably correctly, that the bird had returned to its store and eaten the remains of its victim.

In view of the above interesting observations it seems highly probable that the Red-head is more of a food storer than our scanty records indicate, and that elsewhere than in the locations mentioned it depends to a greater or less extent upon food laid by for future needs.

The crow is certainly one of our most sagacious birds, but, so far as I know, no one has ever found it storing away supplies of any kind though it inhabits regions where in winter it is often put to it to make a living. Perhaps European crows are a bit ahead of their American cousins. At any rate I find a paragraph in Yarrell's British Birds (vol. II, p. 288) which seems to prove that the habit is not entirely unknown to at least one member of the crow family, namely, the Black Crow (*Corvus corone*). Yarrell says of it: "Its method of hiding portions of food that cannot be conveniently eaten suggests an amount of forethought that can be pardonably exaggerated." This statement regarding the Black Crow calls to mind Dickens' raven, or rather the compound of his two ravens, which he immortalized under the name of Gripp, and which he says had the habit of burying in the garden "cheese and halfpence". Gripp, however, was a remarkable bird in so many different ways that we need not wonder at this departure from the usual habits of his kind.

Our jays are mast eaters par excellence, and I believe that closer field observations will show that the habit of storing supplies is more common among them than we have been led to believe, particularly the species that winter in the colder regions. I am not aware that the Blue Jay, or, indeed, any of the species within our own boundaries have acquired the habit, but the Whiskey Jack of the far north, according to Richardson*, is fully alive to the importance of laying up food against the time of snow and extreme cold. He says of it: "It hoards berries, pieces of meat, etc., in hollow trees or between layers of the bark of decaying branches, by which it is enabled to pass the season in comfort, and to rear its young before the snow is off the ground, and indeed earlier than any other bird in the fur countries."

Turning now to the nuthatches we might confidently predict that such lovers of mast would have hit upon the storage plan, but data on the subject are not over plenty. In the History of North American Birds, by Baird, Brewer and Ridgway, we find a note stating that "the European species collect and store away the fruit of the hazel and other nut-bearing trees", and I am sure that our own species, the white-belly, has been credited with the same habit, though I can find no direct reference to the subject. This would seem to indicate at least that the habit is not common. Dr. Chas. W. Richmond, however, informs me that not once but many times he has seen nuthatches, familiar guests at his lunch counter, bear off and store away peanuts and even suet in the crevices of the bark of trees and in the cracks left by the weathering out of the mortar in the walls of his house. This habit of storing suet in cracks in the bark of trees has been observed about Washington also by Dr. A. K. Fisher and Mr. McAtee. Ordinarily, however, it is probably true that the White-bellied Nuthatch, energetic worker as he is, finds no surplus to store, but has to devote all his energies to digging out today's supplies without taking thought of tomorrow. Given the surplus, however, to draw upon, the bird's instincts, as we see, are equal to the occasion.

To return to our California Woodpecker: I see no valid reason for accepting the theory of the older ornithologists that the holes in the bark and dead limbs of trees were originally bored by the birds in the pursuit of insects. Apart from the fact, as has been dwelt upon, that this particular woodpecker

*Fauna Boreali-Americana, 1831, p. 295.

is only to a small extent an insect eater, the holes, at least those I have examined, are usually bored in sound wood or bark, and the wood around the holes shows no signs of ever having been inhabited by larvae of any kind.

The choice of trees to act as granaries has always seemed to me largely a matter of chance, being chiefly determined by proximity to the acorn-bearing trees. Their bark being soft and easily drilled, pines are, perhaps, on the whole the favorite trees. But I have seen scores of dead oaks, the bark of which had long disappeared, which had been used apparently for years for storage purposes, and in many of these every available bit of space had been utilized.

I do not seem to be able to recall any instances of the use of live oaks for storage purposes, but Dr. Merriam and Dr. Fisher both assure me that live oaks (*Quercus agrifolia*) are occasionally selected, and a photograph made by Dr. Fisher on the premises of Dr. Jordan at Palo Alto (see frontispiece, Condor, VIII, September, 1906, p. 106), is visible proof of the fact. Probably in this and other similar cases it is Hobson's choice, and live oaks are taken because they are the best available.

An example of a still wider departure from this bird's custom appears in the accompanying photo (fig. 22) made by the author near Ukiah, Mendocino County. The colony of woodpeckers located here had taken advantage of the long summer vacation, when the building was untenanted, to improve the school house up to woodpecker standards; and, while the results would hardly commend themselves to the school supervisors, they at least increased the utility of the building from the woodpecker standpoint. Nor is this example of woodpecker industry highly exceptional, and Mr. Carpenter, then a photographer of Ukiah, told me that in an adjoining county a school house had been so disfigured by woodpeckers that it was found advisable to build a new one rather than to repair the old. Such instances of serious injury to buildings must be rare, if for no other reason than that it is only in structures temporarily abandoned that the birds find their opportunity.

It is of interest to note that, while holes drilled in trees for this and for no other apparent purpose by the California Woodpecker is its common method of storing acorns, it is not the only one. Thus near Ukiah I found the woodpeckers harvesting the acorns and dropping them into the cavities formed by hanging pieces of bark, some of these containing from a gill to a half pint or more of the mast. This departure from the birds' usual custom is the more difficult to explain since there were plenty of pines near by of which they might have availed themselves. Sumichrast found them doing the same thing in Mexico as quoted by Baird, Brewer and Ridgway, North American Birds, vol. II, p. 571. After describing the usual method he adds: "At other times they make their collection of acorns in the openings between the raised bark of dry trees and the trunks". Such cavities, indeed, may have been the original store houses. If so, the present method is a decided improvement, since, when stored in such cavities, there seems to be no way by which the birds can reach them, though they are quite accessible to mice and squirrels. This particular storage method furnishes a remarkable example of undiscriminating instinct. The bird follows the blind impulse to store, but in such an ineffective way as to gain little or nothing by the act.

That acorns are often "wormy" everyone knows who has gathered them

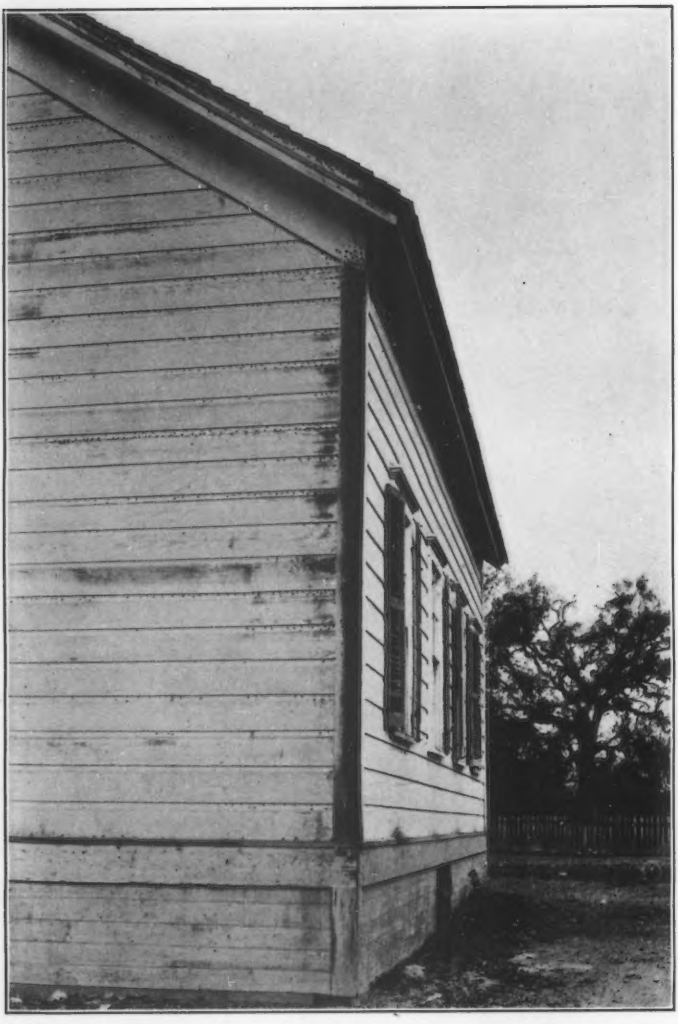

Fig. 22. Schoolhouse near Ukiah, Mendocino County, California, used as acorn granary by California Woodpeckers.

for study or for other purposes, but I find no convincing reason for the belief that the California Woodpecker is sufficiently versed in entomological lore as to store away acorns for the sake of the weevils that later are developed in them. If proof to the contrary is desired it is to be found in the results of Beal's investigations of the food habits of the species in Biological Survey Bulletin No. 34. He there states that 77.57 percent of this woodpecker's food consists of vegetable matter, compared to a little less than 23 percent of animal matter, which of itself compels us to class the species as chiefly vegetarian. Moreover he found in the stomach contents the remains of no boring larvae whatever. Notwithstanding the absence of larvae in the stomachs of the 75 specimens examined by Beal I do not doubt that larvae of any sort would be welcomed by the woodpecker, but evidently they are not specially sought for. The bird is essentially vegetarian, and, indeed, as Beal points out, more than half of its food consists of the meat of acorns.

In passing, we may note that only 21 percent of its food throughout the year consists of ants, which, while a respectable allowance, is small when we recall the fact that Swainson, in selecting a specific name for the bird, called it "formicivorus" or ant-eating, thus laying undue stress upon its ant-eating habits.

The discovery of the edibility of the acorn, however, was not made alone by the woodpecker. Even today the acorn crop is an important one to the Indians, and in bygone days it furnished the California aborigine his most important staple. There is, too, quite a list of birds and mammals that are more or less dependent for food upon the acorn, and, one and all, these are looked upon by the woodpecker as enemies and treated as such. His store houses are well known to jays, mice, rats, and squirrels, and are regularly raided by these less industrious and unscrupulous foes whose rule of conduct is well expressed in the lines, "He should take who has the power; He should keep who can." When at home the woodpecker has little trouble in defending his own, but we may safely assume that no small part of his hoard always goes to his unscrupulous neighbors.

An incident witnessed by me illustrative of the warfare waged by the woodpecker against the squirrel may be worth relating. While out one day in Mendocino County with my camera I heard loud outcries from 8 or 10 "Carpinteros" coming from a dead oak. Inspection revealed a ground squirrel flattened out on a limb some forty feet or more from the ground, this being the first and only time I ever saw a ground squirrel as far from mother earth, although in this county, which is heavily wooded, the ground squirrels are more addicted to climbing trees than I have observed elsewhere. Apparently the squirrel had been detected in the act of robbing the woodpecker's larder, but I arrived on the scene much too late to witness the beginning of the fracas. The birds were thoroughly enraged and were taking turns in making spirited dashes at the squirrel, at the same time filling the air with their vociferous threats. It was quite evident that the squirrel might have escaped from his foes easily enough by running down the tree or by jumping to the ground, apparently no great feat even for a ground squirrel; but he seemed to be completely paralyzed by fright and afraid to move in any direction or do anything by way of self protection. After watching the strife for some time and noting that it was likely to be a prolonged one the squirrel was brought down

for close examination by a small bore rifle. It was then found that the attack by the birds was even more serious than it appeared, for they had punctured the skin in places along the back and drawn blood with their sharp bills, and in time, perhaps, might have killed the rodent.

The California Woodpecker is not exceptional in its hatred of its traditional enemy, the squirrel, and Merriam, as above cited, was witness to attacks by the Red-head on both the grey and the black squirrel. Evidently the woodpeckers of the Adirondack region look upon the crop of beech nuts as peculiarly their own, and promptly resent on the part of outsiders any attempt to share in it. Not woodpeckers alone are a bit hazy in respect to property rights, and the enforcement of conflicting views on the subject often leads humans into acts that bear a curious analogy to the ones above noted.

Take him all in all, the California Woodpecker presents a rarely inviting subject for study, especially with reference to the genesis and significance of its food storing habits. Since California at the present time is exceptionally fortunate in the number and activity of its bird students it is to be hoped that among them are those who will take up the subject systematically, and endeavor to unravel the many puzzling questions that touch upon the life history of this beautiful and interesting species.

Washington, D. C., May 15, 1921.

THE STORAGE OF ALMONDS BY THE CALIFORNIA WOODPECKER

By CLAUDE GIGNOUX

WITH ONE PHOTO

ON Saturday, March 26, 1921, I spent about two hours inspecting the larger trees and the buildings on the ranch of Mrs. Nora Thresher, in Butte County, California, to obtain information in regard to the storing of almonds by the California Woodpecker (*Melanerpes formicivorus bairdi*). The three places at which we found almonds stored are close together near the ranch house. The locality is one quarter of a mile west of the Feather River, five miles northeast of Liveoak, four miles southeast of Gridley and one and a quarter miles east of the Manzanita School, and is in Township 17 N., Range 3 E., M. D. B. and M. The country for several miles in every direction is practically level and very fertile and the mature native trees left standing are magnificent individual specimens. There are many fruit orchards in the section from Marysville to Gridley, and almonds are extensively grown farther north, around Durham. On the Thresher ranch there is a very heavy growth of trees and brush along the Feather River and this heavy growth extends a considerable distance in both directions along the river beyond the boundaries of the ranch.

Mr. Gerald J. Chalmers, whose ranch adjoins the Thresher ranch, had told me that he had found almonds stored in the bark of an oak tree, on the Thresher ranch, which had been cut down about the middle of February, 1921,

a slab of which he kept and handed to me on the day of our hunt for stored almonds. This slab is 16 inches long, 5 inches wide at one end and 7 inches wide at the other. It has been delivered to the Museum of Vertebrate Zoology in Berkeley. The photograph of a portion of this piece gives a clear idea of just how the original appears (see fig. 23). The tree from which it was taken had been cut down, sawed into firewood lengths, and split up by a machine. The pieces were then thrown into a pile and ranked in tiers. In this process each piece of wood had been subjected to a great deal of rough handling and it is surprising that any of the nuts remained in the bark.

We found almonds stored at three places: (1) In the bark of the oak tree mentioned; (2) in the side of a rather old barn; and (3) in the bark of a

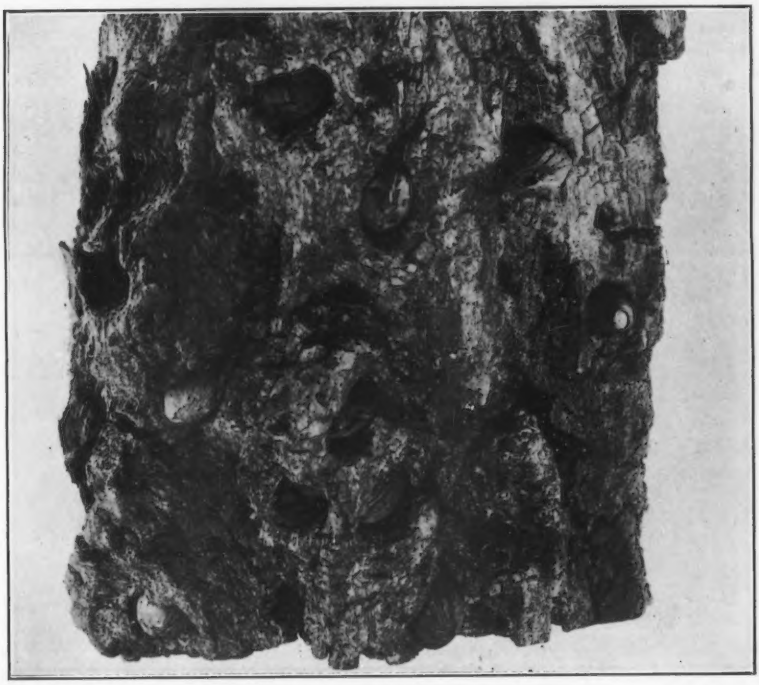

Fig. 23. Portion of slab from Valley Oak showing almonds and acorns in pits, the work of California Woodpeckers in Butte County, California.

living, standing oak. There were within an area of perhaps ten or a dozen acres about fifteen large standing oaks, five or six recently felled oaks and several farm buildings, some of which were quite old. A crew of men was cutting up one of the trees and ranking the wood up in tiers.

At point number 1 the tree had been cut down close to the ground and completely cut up in firewood lengths and these ranked in tiers. We found several pieces, in the bark of which acorns and almonds had been stored or in which holes had been drilled for acorns or almonds. The slab in the photo-

graph is a part of this tree. Mr. Chalmers said that this tree was almost wholly dead when felled. The slab shown in the photograph is dried and worm-eaten. Nothing was learned as to the part of the tree from which the slab came but it was evidently from the trunk or a large limb. Mr. Chalmers thought the tree was a Valley Oak (*Quercus lobata*), but this is not intended as a definite identification. From the number of drilled holes with or without acorns or almonds in them it was evident that the bark of the tree had been extensively used as a storage place both for acorns and almonds. There were several large decayed holes in the tree and in these we found both acorns and almonds, but they were not fitted into specially drilled cavities. When the tree was felled Mr. Chalmers was present and he told me that a pair of owls flew out of one of these large holes after the tree had fallen to the ground. We learned nothing as to the means by which the acorns and almonds were placed in these decayed cavities. The only opened almonds we found were from these decayed places. We thought that these almonds had not been opened by woodpeckers.

At point number 2 holes had been drilled in the boards on the west side of a large barn and many acorns and a few almonds stored in them. All the holes were above the level of the top of the main door. All the drilling had been done in boards resting against the larger timbers of the frame. There were drillings in the ends of boards where the boards rested against a horizontal plate over the doorway and pretty much across the front of the barn along this timber and up along the upright timbers as well. No holes were drilled except in the outer surface of the boards where the boards rested against the frame. We thought that the holes, or most of them, went through the boards and into the timbers of the frame.

At point number 3 the bark of the whole trunk above a point about twelve feet from the ground and most of the bark of the larger limbs had been drilled and hundreds if not thousands of acorns and almonds stored. Mr. Chalmers expressed the appearance of the bark very well when he said, "There must be a sack of almonds up there". This tree was a living oak and we thought it was a Valley Oak. There were more dead limbs on this tree than we found in other similar trees in the vicinity. The tree is very large and must be about five feet through the trunk one foot above the ground. In some of the limbs were holes that we thought were the entrances to the nests of woodpeckers but we did not see any birds enter or leave them. Acorns and almonds were stored in all sides of the tree and in all sides of the larger limbs we could see from the ground. We did not go up into the tree to see if nuts had been stored in the bark on the upper sides of the limbs.

This work is assumed to have been done by the California Woodpecker, which is a common bird in that country. The acorns were stored in the manner known to be employed by this bird and there seemed no reason to deny it credit for the almonds also. We did not, however, see them doing anything in connection with the storage places we found. Nearly all the acorns and almonds were inserted in the drilled holes point first but some were fitted in natural crevices sidewise. All acorns had been freed from their cups before being stored and all the almonds were without hulls. We thought that this tree contained about an equal number of almonds and acorns. Every nut was fitted in its place too snugly to be easily removed. In most cases the base of

the nut was flush with the surface of the bark or even a little countersunk. Some few were inserted so as to protrude more or less. Some were inserted about a quarter of the length of the nut but very tightly at that. Here and there was a nut too small to fill the hole made for it, but the orifice of the hole was too small to permit the nut to be easily taken out. There were many empty holes and some holes only partly drilled. Many of the acorns had been opened and the shells left in the drilled cavities. We did not find any opened almonds (except in the one instance noted) although many empty holes were found where almonds had been or which had been drilled for almonds. The difference between holes drilled for almonds and those drilled for acorns is very marked. We could not detect any disposition to drill the holes so that they would not hold water. All were about horizontal. Several almonds in the drilled holes looked as if an effort had been made to open them. The opening of an almond presents no difficulty to a bird that can cut a hole in dried oak.

Of course, acorns must be abundant all about. Mr. Chalmers said there were two almond trees on the Thresher ranch and I was told that until this spring there had been an almond orchard less than a half mile to the north.

Oak trees and California Woodpeckers have existed together for so long a time that they may be considered coetaneous. But almonds are not indigenous in California. The habit of storing acorns may have developed very gradually, but to whatever extent this bird has acquired a habit of storing almonds the development must have been of recent origin. The subject suggests many interesting possibilities and theories but I do not feel competent to go into that phase of the matter.

A gentleman living at Liveoak told me he had seen almonds stored in electric light or telephone poles at Pennington, eight miles east of Liveoak, and that he had heard of walnuts being stored in the same manner, but he could not give any details about the walnuts.

Berkeley, California, March 31, 1921.

THE FLOCK BEHAVIOR OF THE COAST BUSH-TIT

By R. C. MILLER

WITH MAP

THE STUDY of birds has had a tendency in the past to be extensive rather than intensive. The ornithologist has been engaged with the problems of distribution and speciation, of migratory instincts and migration routes, of coloration and adaptation, of food and economic importance, all of which, while thoroughly justifiable, have involved a generalized consideration of a large number of species. It has seemed to the writer that much is to be gained from a careful study of a single species, or even, as in the case of this paper, of a single aspect of the life history and relations of one species.

The study of birds from a behavioristic standpoint has been relatively neglected, and those investigators who have given the matter some attention have usually gone to one of two extremes: the field observers, being better naturalists than psychologists, have interpreted the behavior of birds in an extravagantly anthropomorphic fashion; and the experimentalists, being better psychologists than naturalists, have with amusing seriousness taken caged birds into the laboratory and assumed that they would there behave in normal fashion (cf. Porter, 1904 and 1906). What we need would seem to be a new science of "field psychology" which should combine in due proportions the observational and experimental methods.

The studies in behavior which follow* have been limited to the coast race of the Bush-tit (*Psaltriparus minimus minimus*), which occurs in considerable numbers on the Berkeley Campus, ranging over more or less definite areas of live oak and chaparral associations, or cultivated shrubbery. The birds are gregarious during the greater part of the year, pairing off in February or March for the breeding season, and congregating into flocks again when the young are reared. The flock formation is relatively simple and loose, so that a much better opportunity is offered for analyzing flock-behavior than would be the case with birds manifesting a more complicated flock organization. Moreover, observation has convinced me that the birds remain pretty much in the same locality all through the winter, so that the complication of a changing series of flocks is not introduced.

The University Campus and neighboring hills and canyons have served as the field of operations.

Three flocks of Bush-tits have frequented the territory under observation during the past winter (1920-21). The largest of these numbered about seventy individuals, the other two, respectively, twenty-five and twenty. These figures are based on averages, as the number of birds in a flock often varies in a puzzling manner, even while under actual observation. Such discrepancies are doubtless due in part to the difficulties involved in making accurate counts. The little creatures are in constant motion, popping in and out among the bushes, appearing and disappearing in a confusing manner, so that they can be successfully counted only as they occasionally straggle across an open space along the forage route. But allowing for a margin of probable error, the impression is still conveyed that there is an actual variation in the number of birds in a particular flock at different times, individual birds perhaps becoming lost, or passing from one flock to another.

These three flocks were observed on August 28 and again on October 16 and subsequently, but not until the middle of the winter did the idea occur to me that they might represent the entire Bush-tit population of the region under observation. Thereafter I made a practise of "rounding up" the Bush-tits in the locality from time to time, always beginning by scouring the campus thoroughly, then working up Strawberry Canyon. In every case I was able to locate the three flocks above mentioned.

In addition to these periodic round-ups, I have made a practise of keeping record of every flock of Bush-tits seen on the campus, with time of day, general

*NOTE.—This paper is chiefly an abridgement of a Master's thesis written at the University of California during the current year. I am indebted to Professor Joseph Grinnell, under whose guidance this work was undertaken, for many helpful suggestions as to method, as well as much valuable information from his personal observations.—AUTHOR.

direction of movement, and numbers, either actual or estimated. I find these observations to agree with my assumption of three flocks, one large, the other two smaller and of nearly equal size.

It is manifestly impossible to be absolutely certain that flocks of similar size observed in the same region at different times are identical; but repeated observation has given the impression very strongly that the flocks observed in February are in general the same ones seen in August preceding, though individual birds probably sometimes pass from one flock into another. I may add that I have never observed the Bush-tits more than one hundred yards up along the sides of a canyon, and it may be that relatively small hills, especially when sparsely clothed with vegetation, form to them a somewhat effectual barrier. I think it extremely unlikely, for instance, that the number of birds in Strawberry Canyon would be augmented by an invasion of Bush-tits from Claremont Canyon, or vice versa. The topography of the region furnishes additional reason for believing that the birds I have had under observation are limited to the narrow range which I have assigned to them.

I early noted that, as Swarth (1914, p. 501) has observed, the Bush-tits appear with considerable frequency in certain tracts of trees and bushes on the campus, so as to suggest the possibility of their having definite forage routes, which are covered at more or less regular intervals. Working on this hypothesis, I undertook to map out the forage routes of the different flocks, and, by taking note of the intervals at which they recurred at certain definite points, I thought perhaps to be able to prepare a schedule of their movements. At first I seemed to have some degree of success with this part of the work, and on one or two occasions I was able to predict the whereabouts of a particular flock from my hypothesis, and to find the birds exactly where I had expected them. But frequent subsequent failures have led me to conclude that success on these occasions was entirely accidental; and as I now look through my notes, I am unable to trace out anything approaching systematic progression over a well defined route. Any impression of regularity in the movements of the birds is doubtless due to mechanical causes, such as relative density of shrubbery and other foliage in different parts of the range.

A method of observation to which I have been partial is that of attaching myself to a particular flock of Bush-tits and following it about for a considerable period of time. For purposes of illustration, I wish to record in some detail the wanderings of a flock observed in Strawberry Canyon on February 11. A map of the region in question has been introduced (fig. 24), which should be consulted in interpreting the following account.

9:35 A. M.—Flock of 16 Bush-tits observed at A. Foraged through bushes to B; 5 birds crossed road to C, then straggled back again to B, then to D; one returned to C and foraged alone for several minutes, then was joined by 6 others. The remainder of the flock retraced to A, then moved on to E, to be followed shortly by the stragglers at C. The entire flock then moved across the road to F, which marks the edge of a small but dense thicket.

From F the flock foraged in a leisurely fashion through to the east side of the thicket at G, then along its edge to J. At G one bird left the flock and crossed to H, where it foraged about 8 minutes, then rejoined the flock at I. From J the entire flock then retraced to I, crossed over to H, then moved slowly on to K and finally L, where they foraged in a live oak for a considerable period of time. At * one bird flew down and foraged for a few moments in the grass, a quite unusual type of behavior, which I have seen on only one other occasion.

One bird presently moved across to the bay tree at M, and was followed shortly afterwards by two more. Three others retraced to H, and the main body of the flock straggled after. The birds at M, finding themselves left behind, hastened after their companions. All now returned to the thicket at N, foraged slowly over to O, then down to P, and finally crossed the road to Q in their characteristic straggling fashion, one bird venturing out and being followed shortly by the others.

In counting the birds as they flew across the road at this point, I was surprised to find that the flock now numbered 21; 5 stragglers, either of this or some other flock, had been gathered up in the thicket.

The flight from P to Q occurred at 10:45, the flock having remained for almost an hour in a patch of brush about one-eighth acre in extent.

The birds foraged in the one large oak at Q for 24 minutes. At 11:00 o'clock one bird ventured to another oak at R, but none of its companions followed, and it soon returned. At 11:09 a bird flew across to S, but seemed timorous and at once returned

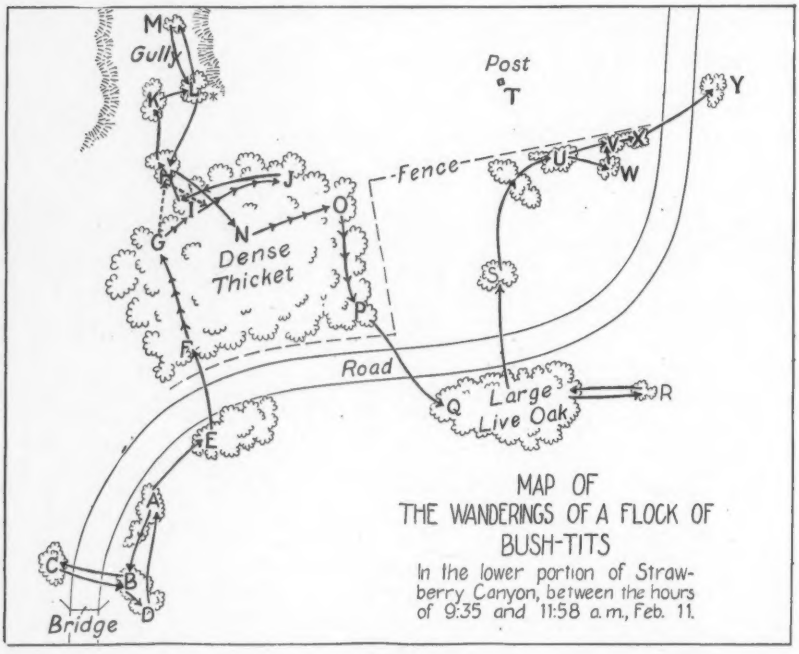

Fig. 24.

to Q. Then another ventured across, and the flock presently followed in their usual manner. At T a Sparrow Hawk appeared and perched on a near-by post, but was not noticed by the Bush-tits.

At U the flock became divided, about half remaining at V, the rest foraging in a fallen oak (still green) at W. Later the two divisions rejoined, with the exception of 4 individuals (2 pairs?) which remained behind and did not rejoin the flock as long as I observed them. I interpreted this as an indication of the advent of the mating season, when the flocks gradually break up into pairs. Subsequent observations showed the flocks to be rapidly dwindling, and tended to confirm this opinion.

While the birds were in the oaks, a California Jay swooped in among them, causing great alarm for a moment, until the intruder was identified. This reaction to Jays I have frequently noticed, although as far as I know the larger bird does not harm the Bush-tits, and they manifest no fear of a perching Jay.

About noon one bird flew across the road to the clump of oaks marked Y, and was followed by 13 others. Three more followed hurriedly a little later. I did not observe the birds further.

Thus it is seen that the flock when first observed was composed of 16 individuals, that 5 were added while the birds were in the thicket, and that 4 later left the flock, so that the number remaining when observations were discontinued was 17. This affords a good example of the puzzling fluctuation in numbers which I have above mentioned as leading me to conclude that the flock organization is relatively loose and that birds probably pass from one flock to another with considerable frequency.

Doubtless the reader, if he has had the patience to follow the observations above recorded, has been struck with the lack of system or direction and the unnecessary retracing of routes manifested by the birds, their behavior in this respect being somewhat suggestive of that which Mark Twain has attributed to ants in his classical essay on that subject. The method of progress of the birds may be analyzed as follows:

The flock is foraging, let us say, in the outer foliage of an oak tree. The twigs and leaves are examined in quite a thorough manner, the birds inspecting them from above, or clinging, as they do frequently, upside down and examining the under surfaces. Presently some individual finds the forage poor; no more scale insects or aphids are to be found in its immediate vicinity; it begins to look about in search of fresh fields and pastures green. Yonder is a clump of chaparral that looks promising. A few yards of open space must indeed be traversed in order to reach it, and Bush-tits have a native abhorrence of open spaces; they are natural agoraphobiacs. But hunger is a strong stimulus. The bird hesitates a moment, then darts out and with hurried, undulating flight crosses to the chaparral.

Now other individuals of the flock find food beginning to run short in the oak foliage. They too see the near-by clump of chaparral; they have seen their companion make the flight successfully; they hear his notes, perhaps indicating that he has found food; they themselves are encouraged to make the venture.

Now the impulse spreads; in groups of two or three or five, others dart across from the oak to the chaparral, until shortly the whole flock has moved to the new location.

I would not attempt to maintain that all the steps I have indicated here pass as successive ideas through the minds of the birds. I have merely outlined the impression which their behavior gives to the observer. The analysis of what goes on in an avian mind is a problem which the comparative psychologist does not regard with appreciable optimism. But of the following objective facts we may, I think, be certain:

1. The flock moves from place to place by what may be termed the spread of impulse. An individual bird, moved no doubt by the hunger instinct, takes temporary leadership, and is followed to a new location by the others. There are no regularly assigned leaders, though probably the most venturesome birds assume the leadership most often.

It should be noted in this connection that Trotter (1916, p: 29) has attributed a similar type of behavior to the mammalian herd: "Each member of the flock tending to follow its neighbor, and in turn to be followed, each is in some sense capable of leadership".

2. The line of flight between two locations is usually determined by the first adventurer. Ordinarily it represents the shortest distance across an open space. The other birds gather at the point of departure and follow suit, possibly through imitation, or because the tested route appears the safest.

3. Sometimes two or three self-appointed leaders move off simultaneously in different directions. It seems then to be largely a matter of caprice which one the flock follows. Each leader may have a following, and the flock for a time become divided into two or three segments; or the flock may follow any one of the leaders. In any case a bird which ventures into a new location and is not followed by others soon loses its wanderlust and hastens to rejoin its comrades.

4. Individual birds which are finding good foraging may lag behind until the flock is some distance away. Then they appear suddenly to wake up to the fact that they have been left alone, and hurry after the flock with excited calls. Occasionally these loiterers become lost entirely; thereupon they become greatly agitated, and move rapidly from place to place, uttering the location note so loudly and continuously that I have sometimes mistaken the notes of a single bird for those of an entire flock. It is extremely probable that such lost birds attach themselves to the first flock they find, regardless of whether or not it is the one of which they originally formed a part.

5. At more or less frequent intervals the flock tends to become assembled in a relatively small space, the branches of a single oak, for example, and there to pause long enough for stragglers to catch up. It will be seen by reference to the observations above recorded that such reunions occurred at points E, J, and Q. This type of behavior is probably unmotivated, and may even be due to mechanical causes, such as the nature of the forage route; but it is of frequent occurrence, and probably is of considerable importance in keeping the flock together.

6. Call notes play an important role in flock behavior (cf. Grinnell, 1903). The principal notes are a location note, uttered more or less continuously, which functions in keeping the flock together while foraging, an alarm note, and a "confusion chorus" which is uttered by all members of the flock in concert on the appearance of certain enemies, e. g., a Sharp-shinned Hawk.

7. The method of flock movement makes evident the extreme improbability of there being any definite forage routes. The direction taken by the flock at any time is a matter of caprice, or the circumstances of the moment. Due to their dislike for crossing open spaces, however, the birds are likely to frequent areas where the vegetation is continuous and will generally avoid those where it is discontinuous, so that an impression of regularity in their forage movements may thus secondarily be given.

Whether or not the differences between the flock behavior of the Bush-tit and that of various other birds manifesting a more complicated type of flock organization are differences of kind or of degree only, is a subject for further investigation. There is a field here for much interesting and profitable work, and it is the belief of the writer that such studies are likely to be

of value in connection with the general problem of group psychology.

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Department of Zoology, University of California, June 11, 1921.

GENERA AND SPECIES

By RICHARD C. McGREGOR

I HAVE read with much interest and appreciation the article by Witmer Stone on the use and abuse of the genus[1]. Briefly stated, Doctor Stone's protest is against the excessive division of genera that has been proposed by some recent authors; he suggests that we use the broader generic divisions of a few years ago for nomenclatural purposes, restricting the finer superspecific divisions to occasions when such distinctions are required. This subject erupts more or less periodically[2], and one might derive some entertainment from a study of its cycle and predict the year of the next activity.

As ornithological nomenclature has been one of the chief sufferers from the abuse described by Doctor Stone, it would be appropriate for the *Condor* and other leading ornithological journals to publish comment on this subject. Therefore, a few words are offered for the sake of provoking discussion.

The general tendency, in ornithology at least, is to recognize finer and more trivial characters and, accordingly, to break up old groups and to name more families, genera, etc. With ever-increasing collections and the more intensive study of specimens, the systematist inevitably recognizes differences that escaped detection before, and exaggerates the significance of minor differences. The result is that the genus must be based upon slighter characters than formerly; the rank of the group is thus degraded. This may lead to a condition in which each species of a family is the representative of a genus, the interrelations of the species are no longer indicated, and the generic names become absolutely worthless.

The groups of taxonomy are imaginary and have no existence in nature.

[1]Science, vol. 51, 1920, p. 427.

[2]For example, note the activity of about five years ago, indicated by Sumner, F. B., Science, vol. 41, 1915, p. 899; Van Name, W. G., Science, vol. 42, 1915, p. 187; Colton, H. S., tom. cit., p. 307; Allen, J. A., tom. cit., p. 492.

The limits of a group can be stated only in relative terms. A species is one kind of an organism, but the degree or the quality of difference that shall separate one species from another cannot be stated. A genus is a group of closely related species, but no one can say how closely they must be related. Even the individual is but a phase in the great organic stream and is intimately connected with its parents and its offspring. If we had before us all of the expressions of life that have been, who could venture to designate genera and species? When we say that a species is well marked, we mean that we are ignorant of its close relatives, which may be living or fossil. While we are defining a species, it becomes something else. The present is gone as we say it and has become the past. In practical taxonomy, of course, we treat genera and species as if their characters were fixed, and fortunately most of the species of taxonomy differ enough so that they can be easily recognized.

I have long believed what Doctor Stone points out; namely, that we try to make our system of nomenclature do double duty and that this is an "impossible burden" or, at least, it is an attempt to force on the generic name a function for which it is not fitted. I have also had in mind to suggest exactly the remedy proposed by Doctor Stone; namely, the reduction of the weaker so-called genera to the status of subgenera. My idea is that these subgenera are useful in keys to show the grouping of species in large genera.

Some botanists follow a practice that appeals to me as being very serviceable in connection with genera containing many species; this is the use of the section, in effect the subgenus. The name of a section is placed after the specific name and is used only when it is desired to show the position of the species in the genus. An illustration of this is found in the names of the plants that are commonly called begonias. There are several hundred species assigned to the genus *Begonia*, and probably as many more remain unknown to science. The species fall into several groups that many zoologists would certainly recognize as genera. How many botanists do so I do not know, but the more conservative among them resort to the use of sections when they wish to designate a part of the genus *Begonia*. As Doctor Stone points out, this retention of generic names in the broad sense is of assistance to those who are not specialists in the particular group; at the same time much of the transferring of specific names from genus to genus is avoided. For example, begonias are so well known as cultivated ornamentals that any reader would have some conception of the kind of plants indicated by the scientific names *Begonia pseudolateralis*, *Begonia mindanensis*, and *Begonia luzonensis*. If the section names were given generic rank, the same begonias would appear as *Sphenanthera pseudolateralis*, *Petermannia mindanensis*, and *Diploclinium luzonensis*.

Another method of dealing with the subgeneric name seems to be popular with some entomologists and others—the subgeneric name is inclosed within parentheses between the generic and the specific name. For example, *Colymbus* (*Dytes*) *auritus*, for the horned grebe. This style leads to unpleasant remarks on the part of the indexer, but no one considers his convenience.

Some systematists are inclined to give little consideration to the needs of the student of anatomy, geographic distribution, or general biology. In effect they say: "Only a specialist can judge of the validity of a genus or species." The general zoologist or botanist respects the work of the taxonomist and systematist and must take the classification and nomenclature of

these workers. However, the continual shifting of names and the dividing of satisfactory groups are sure to excite strong protests. No one wishes to return to the Linnaean conception of genera, but the tendency toward the other extreme seems less attractive. Names are for the use of people who talk or write about things, and names whose meanings are frequently changed are unfitted for any purpose.

Old generic names become endeared by long familiarity, but some of them must be sacrificed to the iron law of priority. We concede present convenience for promised fixity, but are we getting it? Certainly the busy genus maker is not helping us. *Anthus, Buteo, Chaetura, Diomedea, Empidonax, Fringilla,* and other old generic names are associated with certain birds, and I hope these names will be with us for a long time. When such names are displaced, shifted to other genera, or otherwise modified in significance, it is difficult to accept the changes in a kindly spirit. When the changes result from giving generic rank to weak subgenera, one is inclined to doubt the value of other work of the author who proposes such changes.

The names of the birds of Europe and of North America have been worked over so carefully that they should be fairly well settled. If they are not, what hope is there for the nomenclature of the birds of Asia, Africa and South America?

Manila, P. I., February 26, 1921.

A SYNOPSIS OF CALIFORNIA'S FOSSIL BIRDS

By LOYE MILLER

DURING the several years that have elapsed since a previous synopsis of the Pacific coast fossil birds appeared in the *Condor* (Miller, 1911), our knowledge of the ancient faunas has made considerable advancement. The present writer has been especially occupied with an extended paper on the avifauna of Rancho La Brea. It seems improbable however that this memoir will be off the press for some time to come; hence it is thought advisable to announce to those interested in the subject, some of the results of recent activity in the California field.

Since the latest general paper on the subject was published by the writer (Miller, 1912) a new bird-bearing horizon, the Upper San Pedro Pleistocene has been explored (Miller, 1914). These beds yielded sixteen species of birds none of which are extinct. Bird remains from the Pliocene of Santa Monica and of San Diego have been collected by Dr. F. C. Clark of Los Angeles. These represent some species of auklet and a goose not distinguishable from *Branta canadensis.* Mr. E. J. Porteous of Lompoc, keeping the interests of science at heart, has rescued from the commercial quarries in the Miocene diatom beds of that region some most interesting bird remains. These specimens were generously turned over to the writer by Dr. David Starr Jordan. They are found to represent a new species of shearwater, two species of gannet, and one as yet indeterminate species of shore bird. This material includes the major portion of the skeleton of each of some ten or more individuals, a fact that is readily seen to hold considerable interest when one considers that a

single fragment of a humerus represents the total previously known bird remains from California deposits older than Pleistocene (Lucas, 1901).

Study of the enormous mass of bird material assembled at the University of California and at the Los Angeles Museum of History, Science and Art has been productive of most interesting results. The following is a synopsis of this work, only part of which has been made public.

Apologies are offered for one synonym imposed upon the literature of ornithology. *Pleistogyps rex* (Miller, 1910), based on a tarso-metatarsus, must give way to *Teratornis merriami* (Miller, 1909), previously established upon a skull and pectoral arch. Repeated occurrence of the two in the same section of the excavations forces the conclusion that the great bird known from the skull and pectoral parts was mounted upon the relatively frail posterior limbs ascribed to *Pleistogyps rex*. The latter genus and species is hereby officially cremated. Two members of the family of old vultures, heretofore unknown in the western hemisphere, have been described (Miller, 1916b). The species *Pavo californicus* Miller has been assigned to a new genus, *Parapavo* (Miller, 1916a), intermediate between the old world *Pavo* and the new world *Agriocharis* of Yucatan. The anomalous walking eagle, *Morphnus daggetti*, has been described (Miller, 1915) as analogous and not homologous with *Serpentarius* of South Africa.

Gavia, *Ajaia*, *Plegadis*, *Geococcyx*, and two species of the Columbidae, listed as lipotypes in 1912, have been added to the Pleistocene fauna. The meager remains first assigned to *Polyborus tharus* are considered, after study of more abundant material, to belong to the species *P. cheriway*. *Botaurus lentiginosus*, *Grus americana*, *Accipiter cooperi*, and *Falco columbarius* have been added to the California list of Pleistocene species. The species *Agelaius gubernator*, *Xanthocephalus xanthocephalus*, *Euphagus cyanocephalus*, and *Otocoris alpestris* are considered best dropped from the rolls at present. Although the Pleistocene remains studied are not distinguishable to the writer's eye from the four above-mentioned local birds, it is assuming too much on his part to assert the identity thereof. The identity is not considered proven. More complete material representing the Recent falcons makes it seem advisable to drop *Falco peregrinus* and add *F. mexicanus* in its stead.

Eliminating tentative assignments from the list, there are now known some sixty-four species of birds from Pleistocene horizons, and one from the Miocene, of California. The state of Oregon exceeds this record by some five or six species.

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Southern Branch, University of California, Los Angeles, California, May 10, 1921.

FROM FIELD AND STUDY

On the Acorn-storing Habit of Certain Woodpeckers.—In a recent article in the CONDOR, Dr. William E. Ritter gives an interesting discussion of the habit of the California Woodpecker of inserting acorns and sometimes pebbles into small holes drilled for their reception in the bark and dead wood of trees. During a two years stay in British Honduras the writer had a good opportunity to observe this same curious instinct in a closely related form, *Melanerpes formicivorus albeolus*. These extremely industrious birds not only store acorns in the same manner as the California Woodpecker, but also deposit them in great quantities in hollow trees and similar places. I have seen a hollow pine tree with a cavity six to eight inches in diameter filled for a distance of nearly twenty feet with acorns dropped into a good sized hole at that distance above the ground. Acorn-filled trees of this sort I found not uncommon. Sometimes an opening at the bottom showed the earlier acorns deposited, completely decayed and crumbling to dust. They must have been there for several years, and probably were not brought by the same birds that completed the accumulation. I often saw the woodpeckers bring the acorns and drop them into these "acornaries".

I lived for some time in an old house in which the roof of an upper veranda had been supported by timbers six inches square. These had been injured by termites and rendered unsafe, and had then been boxed with heavy boards of the proper width. Later the termites had completed their work of destruction and had almost entirely removed the timbers, leaving the hollow boxing. The woodpeckers had made holes near the tops of some of these and used them for acorn storage. One that I noted was filled for a distance of at least four feet, as could be seen where the boards had sprung apart slightly, and possibly much farther.

In these cases it would be utterly impossible for the birds ever to make use of the acorns in any way, yet they go on generation after generation laboriously gathering them. Furthermore, in an even, tropical climate like that of British Honduras, where there can be but little variation in food supply from season to season, it is difficult to see how, under any circumstances, such a habit could be of any great advantage; but even granting that it is so in cases where the accumulation is accessible, these instances show how an over-delevoped instinct may lead to actions not only useless but highly absurd.

So far as the California Woodpecker is concerned, Dr. Ritter's conclusions are in all probability correct. This suggests the possibility that the Central American bird was derived from the more northerly form or from northern ancestry, which acquired the instinct under conditions like those now existing in California, and that, as it pushed gradually into the tropics, it retained the instinct long after it had ceased to be of any utility. Such speculations, however, are of doubtful value.—MORTON E. PECK, *Willamette University, Salem, Oregon, June 8, 1921.*

The Brown-headed Nuthatch in Oklahoma.—The Brown-headed Nuthatch (*Sitta pusilla*) does not seem to have been heretofore recorded from Oklahoma. On July 5, 1920, I saw one bird of this species on a southern yellow pine near Cedar Creek in Pushmataha County. Although the specimen was not taken, there could be no doubt as to its identity since I had ample opportunity to study the bird at close range through field glasses; and, moreover, this locality is well within its expected range, as it has been found in Texas, Arkansas and Missouri.—MARGARET M. NICE, *Norman, Oklahoma, April 7, 1921.*

The Water Ouzel in Arizona.—The scarcity of published records of the occurrence of the Dipper, or as I would personally prefer to call it, the Water Ouzel (*Cinclus mexicanus unicolor*), in Arizona seems to make it desirable to add to these records. On first coming into southern Arizona a few years ago from a locality where I had come to know this bird well and to expect it along the tumbling mountain streams, I confidently looked for it along the principal permanent stream in the Santa Catalina Mountains, but was disappointed. It did not appear to be present either in the lower portion of this canyon (Sabino) or along the headwaters and upper stream where the eastern brook trout has been successfully introduced, and where conditions appeared

to be favorable for this stream-loving bird. Its absence from the Herbert Brown collection, now in the University of Arizona Museum, led to looking it up in Swarth's "Distributional list of the Birds of Arizona" (Avifauna No. 10) where the paucity of published records is noted. Thereafter, whenever opportunity offered, I have attempted to locate this species.

My search was first rewarded in June, 1917, when, on a fishing trip to Oak Creek Canyon eighteen miles south of Flagstaff, I was delighted to see my old friend of former years. At least two individuals were noted, but as they flew back and forth up and down stream all during the day of sport they seemed like a dozen. The number was not possible to estimate accurately except by laying off the trout fishing, which was even a rarer treat in Arizona than the sight of the Water Ouzels; but I should say there were not more than one or two pairs in the portion of the stream fished. While no nest was discovered, the conditions were so favorable and the birds so evidently at home, that I doubt not they breed there.

I did not personally see this species again until June 13, 1920, when the day was spent in Sabino Canyon. During the day a portion of the canyon some two miles in length, from eight to ten miles up from the mouth, was explored, and in the course of the day two birds, presumably a pair, were seen. No evidence as to their nesting was obtained, though from the general non-migratory character of the bird one would assume that they were at home, and especially at that time of the year. (In Utah the Dipper may be seen at any time of the winter along the rushing and consequently unfrozen parts of the streams of the Wasatch Mountains). That portion of the Sabino explored last June lies between the upper and lower portions which I had previously seen, and it is quite possible that in this portion the bird may be a regular resident. If this be true then we have a resident pair of Dippers within twenty-five miles of Tucson.

In the meantime I had talked of this bird to Mr. M. E. Musgrave, Predatory Animal Inspector of the Biological Survey for Arizona, suggesting that he be on the lookout for it in his more extensive travels about the State. Mr. Musgrave now kindly furnishes the following Arizona records:

"During the year 1918 along Oak Creek; also during the same year along the Black River and its tributaries east of Fort Apache, Arizona; and one on Beaver Creek near Montezuma's Well, north of Camp Verde. In June, 1920, along the White River, about ten miles east of Cooley, and a few days later two pairs nesting on a small creek known as Trout Creek, which is a tributary of White River and which comes in southeast of Cooley about five or six miles; also in the same month several of these birds along White River south as far as the Indian Saw Mill, below Cooley about ten miles. On February 1, 1921, one on Lime Creek, a tributary to the Verde River, about forty miles north of Phoenix."

Taking these records in connection with those gathered by Swarth, it seems reasonable to assume that the species under consideration occurs rather commonly along the mountain streams of the northern and northeastern high plateau and mountain region of Arizona, while its occurrence in the ranges of the southern part of the State is either sporadic or limited to a few individuals here and there along the most favorable streams, there being at present one record each for the Huachuca, Chiricahua, and Santa Catalina mountains. The streams in the Catalinas and Santa Ritas, and probably also in the Rincons, are decidedly barren of such aquatic insect nymphs as Plecoptera (stone flies) and Ephemerida (may flies), on which the Utah Dippers appeared to me to feed largely. These streams are also rather barren of caddis worms (Trichoptera larvae) which would seem to offer a good food supply for these birds, but on which I have not actually observed them feeding.

After the above was written, but before mailing the manuscript, I had occasion to again visit Sabino Creek at the point where the two birds were observed last June. It was with the keenest pleasure that I again noted on that date, March 22, 1921, the presence of two individuals of this species at the precise pool where I first saw one in June, 1920. These two kept in close company and are doubtless a resident pair. If opportunity permits, an attempt to discover them nesting will be made this season.—CHARLES T. VORHIES, *Tucson, Arizona, March 30, 1921.*

The Harlequin Duck in Montana.—In the recent excellent "Distributional List of the Birds of Montana" by Aretas A. Saunders (Pacific Coast Avifauna, no. 14, pp. 38-39), are given eight records of the occurrence of the Harlequin Duck (*Histrionicus histrionicus*), which seem to indicate that the species is rather generally dispersed in the state. Three of the localities mentioned, Chief Mountain Lake, Iceberg Lake and Upper Two Medicine Lake, are within the boundaries of the Glacier National Park. Incidentally it may be noted that through a typographical error the reference for the Chief Mountain Lake record is given as the *American Naturalist* instead of Coues' "Birds of the Northwest" where it was actually published. The second record, that of a pair of birds collected by G. H. Trook on the Hayden Survey in May, 1860, belongs to Wyoming east of Jackson Hole, Wyoming, as explained in *The Auk*, vol. xxx, January, 1913, p. and not to Montana. The locality where these birds were taken was in the mountains 107. Trook who obtained the specimens was in Wyoming in May, although later in the season he worked in the Big Horn Mountains, Montana. This leaves Merrill's record in the Big Horn Mountains, Sloanaker's record for Flathead Lake south of the Park, Saunders' record for Birch Creek, Teton County, and Thomas' record for the West Gallatin River in the southern part of the state, as the only records outside the Park.

Since Mr. Saunders' manuscript was prepared, several additional records for the Park have been published, which may be found in Mrs. F. M. Bailey's "Birds of Glacier National Park", pp. 124-126, issued by the National Park Service in 1918. These records indicate the presence of the Harlequin Duck on Mineral Creek, McDonald Creek, North Fork of the Flathead, Grinnell Lake, in Olsen Valley, on Gunsight Lake and at McDermott Falls. At present, records for localities outside the Park are more desirable than ever.—T. S. PALMER, *Washington, D. C., May 8, 1921.*

Oklahoma Field Notes.—*Protective Coloration in Gnatcatcher Nests.* The Blue-gray Gnatcatcher (*Polioptila caerulea caerulea*) in the vicinity of Tulsa, Oklahoma, normally nests in early May. Out of a large number of nests examined by me all but one were located in the common oak of this region. At the time of nesting the oak is always in leaf and the nests are placed in proximity to clusters of leaves. They are also always covered exteriorly with dark sooty gray lichens picked from the oak limbs and are evidently so decorated in order to be inconspicuous. Interiorly the nests are lined with dark-colored fibrous material and shreds of bark. On April 27, 1919, I found a nest which departed in every particular from the usual type. It was of course earlier in the season and the oaks were not as yet in good leaf. This nest was located high up in a slender fork of a small limb in an elm which had just completed budding. The nest was entirely decorated with the red-brown bud sheaths, brown lichens and brown fibrous material. Interiorly the color scheme had been carried out also by the use of red-brown spongy cotton-like material and some silky brown seed filaments from some weed. In addition there were several brown breast feathers of the Bobwhite and other softer feathers of unknown source. The eggs, five in number, were normal in size, shape and coloration. This nest was thus unusual in its early date, in its location in an elm, in the outer and inner coloration, and in being lined partially with feathers—I have never before seen a Gnatcatcher nest lined with feathers. It was in toto a beautiful example of protective coloration, as it blended extremely well with the brown bark of the young limbs of the elm.

Dove Nesting in Thrasher Nest. On May 11, 1919, at Chanute, Kansas, I found a nest of the Brown Thrasher (*Toxostoma rufum rufum*) containing two eggs and located a few feet above the ground in an osage orange tree. On May 16 I again visited the nest, intending to collect a full set, but was surprised when I arrived to note a Dove (*Zenaidura macroura marginella*) resting in the nest. On the Dove being flushed I found the nest to contain the original (supposedly) Thrasher eggs and in addition two Dove eggs! No later visits were made, so it was not learned what the ultimate disposition of the four eggs and fledglings, if any, might have been.

Abnormal Eggs of Crow. On March 20, 1921, while collecting near Tulsa, Oklahoma, in company with Mr. G. A. Abbott, we flushed a Crow (*Corvus brachyrhynchos brachyrhynchos*) from its nest in a small pecan tree. My attention was immediately attracted to the large size of the Crow, for it was by far the largest individual I had ever seen. On climbing to the nest I found it to contain a fine set of five very large eggs. Upon measurement I find them to average 2.00 by 1.25 inches, which shows them to be slightly larger than the average egg of the Raven. The average size of Crow eggs is given as 1.60 by 1.15 inches.

Abnormal Egg of Western Lark Sparrow. In my collection is a set of eggs of the Western Lark Sparrow (*Chondestes grammacus strigatus*) taken on June 26, 1920, at Claremore, Oklahoma, which contains two normal eggs, one normal Cowbird egg, and one extremely large Lark Sparrow egg. This large egg is marked similarly to the other two and measures .95 by .67 inches. Reed gives the average size of eggs of this species as .80 by .60 inches.—J. R. PEMBERTON, *Tulsa, Oklahoma, April 13,1921.*

Relative Dimensions of Aeroplanes and Hawks.—It has been the writer's experience that the majority of the hawks observed by bird students are seen in flight, usually outlined against the sky. The proportional dimensions of a bird can usually be made out, but it is often impossible even for an expert to be sure about the color or markings, especially when the bird is seen against a strong light. We say that a Cooper Hawk has a long tail or that another hawk has long wings, but these members are long or short compared with—what? It would certainly be more exact to say that in the Cooper Hawk the length (the distance from tip of bill to end of tail) is 60 percent of the spread of the wings.

It is a well-known fact that female hawks are larger than males; but measurements show that the ratio of length to spread is about the same in both sexes. This matter of proportion appears to be constant in any given species, irrespective of sex and age, in all full-feathered individuals. Using the ratio of length to spread as a basis, we find that the various species of hawks found in California may be readily separated into two groups, those that have a length *greater than one-half of their spread* and those that have a length *less than one-half of their spread.* With the exception of the falcons, we may safely say that the harmful species can all be placed in group 1 and the beneficial species in group 2. For example, the Cooper Hawk, regarded everywhere as harmful, has a length 60 percent of its spread, while the beneficial Swainson Hawk has a length that is only 40 percent of its spread. (See accompanying table for further figures.)

TABLE SHOWING RATIO OF LENGTH TO SPREAD IN VARIOUS SPECIES OF HAWKS AS SHOWN BY MEASUREMENTS OF BIRDS IN THE FLESH

Genus	Species	Average ratio, length to spread
Accipiter	Cooper Hawk	60%
	Sharp-shinned Hawk	54%
	Goshawk	52%
Falco	Sparrow Hawk	47%
	Pigeon Hawk	45%
	Duck Hawk	44%
	Prairie Falcon	43%
Circus	Marsh Hawk	42%
Buteo	Red-tailed Hawk	42%
	Swainson Hawk	40%
Archibuteo	Ferruginous Rough-leg	40%
Pandion	Osprey	39%

Regarding the relative proportions of aeroplanes and hawks, it may be stated that, in general, aeroplanes are relatively longer than hawks, the ratio of length to span in the former being, in ascertained cases, from 54 to 80 percent. In the recent four-passenger, Orenco type F, Tourister Aeroplane, as illustrated in *Aerial Age* of May 3, 1920, page 253, the over-all length is 25 feet, 10 inches, and the span 38 feet, a ratio of length to spread of 68 percent. The Cooper Hawk has nearly the same proportions as this modern aeroplane; and the harmful bird-hawks (Accipiters) might well be called aeroplane-hawks to distinguish them from the short-tailed squirrel-hawks (Buteos), which are beneficial.—JOSEPH DIXON, *Museum of Vertebrate Zoology, Berkeley, California, June 10, 1921.*

A Murre Tragedy.—The accompanying cut portrays a California Murre (*Uria troille californica*) in a very hopeless as well as helpless condition—he has been "oiled". In the latter part of March, 1920, B. F. Hake and myself tramped from Santa Cruz to Halfmoon Bay, California, practically all the way along the beach. During this trip we saw no less than thirty-five Murres in this predicament. They were in all stages from recently oiled and in fair condition physically to badly emaciated and in many cases dead.

The plumage of the Murre is particularly susceptible to picking up the clots of floating oil that escapes from the oil carrying tankers. This material adheres to the breast feathers as is indicated by the photograph, and, what is much more disastrous, to the feathers under the wings. As a result the feathers mat, allowing the water to get through the feathers and next to the skin with the final result that the bird no longer feeds and soon dies of exposure and starvation, or, before that stage is reached, becomes the prey of the beach-combing coyote.

The oil comes from the tankers that load at various points along the coast. They are ballasted on their incoming trips by filling their tanks with water. When this is pumped out, whatever oil there happens to be left in the tank passes out and floats off to ensnare any swimming birds that happen to come into contact with it.

It is truly a pitiable sight to see these handsome and normally immaculate birds standing or sitting up on the beach or out on a rock vainly trying to preen themselves

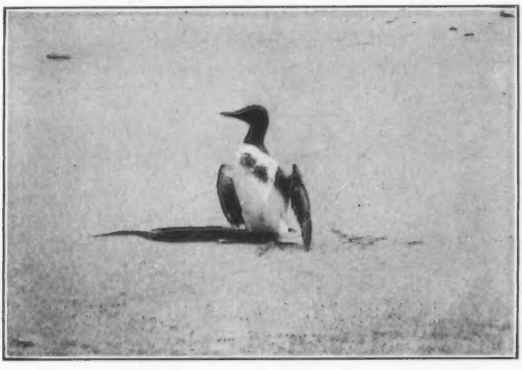

Fig. 25. An "Oiled" Murre.

free of this direful clinging mass; and at last, becoming too weak for further attempt, they sit stoically awaiting the end.

As a matter of interest in passing, the bird in the picture bears in his pose a suggestion of his quadruped ancestry. The use of the wings as props to help maintain an upright position, as well as to assist in propelling while on the ground, speaks in no uncertain terms of an ancestor that used the anterior organs of locomotion for feet rather than wings.

During the month of March, 1919, I spent a week at Pacific Grove and Monterey. During this time I covered many miles along the beach in the vicinity. My first impression of this locality was one of dead birds. An attempt was made to make a count of the carcasses, but after enumerating several hundred the task was given up as impossible to complete. Almost without exception the presence of the soiled and matted plumage, particularly under the wings, was ample evidence of the cause of the mortality. The list was not limited to the Murres but included practically all the birds that frequent Monterey Bay in any numbers.—R. H. Palmer, *University of Washington, Seattle, March 29, 1921.*

Eastern California Occurrences of the Golden-crowned Sparrow.—That *Zonotrichia coronata* is a common migrant along the eastern Sierras, is indicated by the following personally taken notes. The locality is 6700 feet altitude and just east of Sierra City, Sierra County. October 5, 1911, one immature taken and two more seen; October 6, half a dozen seen, two of which were adults; thereafter increasingly common until October 18 when they out-numbered *Zonotrichia l. gambeli* about two to one; thereafter decreasing in numbers till November 8, when one was taken. At this last date there was two feet of snow at this altitude, and open ground under heavy brush must have been difficult to find. In 1916 an adult female was taken September 23. Little time was available for collecting that year so that the single entry does not necessarily indicate any scarcity of birds. In the D. R. Dickey collection is an immature bird taken by L. M. Huey at Potholes, Imperial County, April 18, 1916. This is a short distance up the river from Yuma and is therefore practically on the Arizona line.—A. J. VAN ROSSEM, *Los Angeles, California, March 25, 1921.*

Sparrow Hawk Captures Swallow.—On April 26, 1921, at Stanford University, California, the following observation was made on a Sparrow Hawk (*Falco sparverius*). A number of Cliff Swallows (*Petrochelidon lunifrons*) were building, or repairing, their mud nests on the north side of the museum just under the eves. The hawk was about one hundred yards away on the top of a young redwood tree. While we watched him he sailed gently down to one of the swallow's nests, passing over a group of about fifteen people, supported himself with one foot, hanging nearly upside down in the meantime, inserted the other foot into the nest, and extracted its owner. The captured bird was an adult Cliff Swallow. The nest was not very deep, and the opening was large. The swallow was building up the broken opening when attacked.—PAUL BONNOT, *Stanford University, California, April 28, 1921.*

Bubo virginianus occidentalis in California.—The Museum of Vertebrate Zoology has recently received as a gift from Mr. Carl S. Mueller, of Marysville, California, his collection of bird skins, a large proportion of them being specimens collected by himself in various parts of California. Included in this collection are two horned owls of particular interest as representative of *Bubo virginianus occidentalis* Stone, a subspecies not before recorded from California. These two birds, male and female, were taken at Shumway, Lassen County, on September 18, 1916.

Compared with specimens of *Bubo virginianus pacificus*, from the region to the westward, they are paler, more grayish in general coloration, and with much less admixture of reddish. They are also somewhat larger than the mode of *pacificus*. Compared with breeding examples of *B. v. pallescens* from the lower Colorado River and southeastern Arizona, these specimens of *occidentalis* are darker colored, they have rather heavily marked tibiae as compared with the frequently immaculate legs of *pallescens*, and they are of larger size.

Presumably *occidentalis* is the form of horned owl that breeds in the Modoc region of California, though breeding birds are lacking as yet to prove this. There are two young horned owls in the Museum collection from that part of the state which had been catalogued as *pacificus* but which are doubtless of the subspecies *occidentalis*. One was taken at the head of Pine Creek in the Warner Mountains, the other at the Scott Ranch, ten miles north of Alturas.—H. S. SWARTH, *Museum of Vertebrate Zoology, Berkeley, California, May 13, 1921.*

Calliope Hummingbird at the Flower Show.—Spring comes rather late in the Yosemite Valley; however, Calliope Hummingbirds arrived April 6, this year. For the first few weeks they spent their time on the north side of the valley among the early blooming manzanitas, and no birds were seen south of the river until May 14. On this date a female Calliope discovered the Flower Show in the Village.

This flower show is maintained at the Rangers' Headquarters, and though flowers may be scarce, there is always a fine floral display here. The Calliope was quick to recognize the value of the floral display, and from the day of her discovery she was a constant attendant. The "hummer" appeared not the least disturbed by the crowds of

people that gathered about the stand, but went on about her business of gathering food. She moved from flower to flower on the various shelves but gave special attention to the fiery-red stalks of the snow plant. It was noted that she was especially fond of the bright red flowers, such as *Silene californica, Zauschneria, Castilleia,* and *Pentstemon menziesii.*—C. W. MICHAEL, *Yosemite, California, June 2, 1921.*

Dipper Nesting in Santa Barbara County, California.—Jack Hawley of San Diego told me recently of a Dipper (*Cinclus mexicanus unicolor*) apparently nesting on a stream in Carpinteria, Santa Barbara County. I visited the spot on April 21 and saw the female enter the nest, which I found contained young about three days old. The nest is a little above where the stream emerges from the lowest ridge of the Santa Ynez range on the coast side, at an elevation of less than 500 feet. There is another pair farther up the same stream and another on the next stream, at this season, all presumably nesting.—RALPH HOFFMANN, *Carpinteria, California, April 23, 1921.*

The California Brown Pelican as a Navigator.—Along the coast north of San Diego the long line of bluff is of even contour, broken only by the typical sloughs which occur every two or three miles, but otherwise rises abruptly from the shore and to a height of from twenty-five to over a hundred feet. The prevailing west wind, striking this bluff, is deflected upward, and along this lane of ascending air the California Brown Pelican (*Pelecanus californicus*), in his southward migration, sails swiftly with outstretched wings and head folded back on his body.

The pelicans fly in line formation in small flocks of from five to twenty, and when wind conditions are favorable will often pass and disappear from sight without once flapping their wings. It is an interesting sight to hide near the crest of a bluff and watch them pass, and to note with what poise and little apparent effort they maintain their rapid flight, the only appreciable movement of the body being an occasional slight adjustment in response, no doubt, to the minor eddies and air currents. Occasionally a bird, feeling a desire for nourishment perhaps, which he may be carrying in his pouch for such an occasion, will raise his beak abruptly, his whole body will quiver in a momentary collapse, and then with a few quick wing-beats the bird regains his lost momentum and maintains his place in the line.

The rate of speed seems to depend directly on the velocity of the wind, and probably to some extent on the angle at which it strikes the bluff. The axis of the body is held at an angle with the shore line, with a slight deflection to windward. The phenomenon of the birds' flight is, of course, a process of volplaning down an ascending stream of air and maintaining a definite position relative to the ground. One is surprised, however, at the remarkable efficiency which they exhibit, evidenced by their high velocity in a very moderate wind, and the slight angle at which the body is held in relation to their line of flight. The position usually taken is, roughly, about 75 feet west of the crest of the bluff and about 20 or 30 feet above it. This position may vary from day to day, but at any given time one flock will follow another in very nearly the same line, the birds seeming to instinctively adjust their positions to obtain the maximum lift from the ascending air.

The Pelican is an adept navigator, the observations made above recalling to mind the common sight of the birds racing at express speed along the crest of the long rolling swells before they break on the shore, the case being practically parallel, since the wind striking the outer side of the swell is deflected upward, the angle of deflection increasing as the swell nears the shore. In this case, however, owing to the lesser height, it is necessary for the bird to barely clear the crest of the swell to obtain the desired reaction.

When one observes their apparently effortless and swift flight southward along this stretch of coast one is apt to speculate on how much of his journey the California Brown Pelican is able to make gliding "on the breast of the wind", and judging from observations in this locality I am confident that on an economy run down the coast, on a "miles per gallon" basis, our friend the pelican would be hard to beat.

We are accustomed to observing various birds taking advantage of ascending air currents in their casual flights, but a record of other birds taking such advantage

in their migrational flights would be most interesting, and I hope that others can, perhaps, give us some valuable and interesting light on this subject. At this time I would like to mention also, observations made on the actions of flocks of mixed species of gulls, which I have not previously seen recorded.

The spit of land which makes San Diego Bay a land-locked harbor terminates in two flat areas of land: Coronado Island and North Island, each 2 or 3 miles in diameter and entirely surrounded by water. North Island, in particular, presents a large expanse of level, treeless surface to the sun, and on a calm warm day a large volume of dry warm air develops over this area, surrounded by the cooler and moister air over the water. The ascension of the warm, light air over such a field is familiar to aviators, and the gulls in this vicinity seem to delight in ascending with it.

Starting two or three hundred feet up, they commence to ascend in long sweeping spirals. Their wings are extended and no perceptible motion of the body can be noted, and up, up they sail until almost out of sight, and straining the eye to follow them. They start with perhaps a dozen or two birds, but these are soon joined from all directions by other gulls in two's and three's until 100 to 200 birds are in the air at once. It is quite a pretty sight and suggests to one a column of numerous sheets of paper carried aloft by some giant whirlwind, reaching upward as high as the eye can follow. They appear to sail very leisurely but they gain altitude with surprising rapidity. I have made some effort to estimate the height they attain but find it very difficult on account of the lack of anything stable in the sky with which to compare them.

When evidently satisfied with their evolutions the gulls disband, many of the birds volplaning to earth again to resume their never-ending quest for food, but others seem to use this method for gaining altitude for a long flight, perhaps to some neighboring island, as the last one sees of them as they disappear from sight, they are still sailing, with their wings outstretched, toward the distant horizon.—C. H. Woodward, *San Diego, California, April 16, 1921.*

White-throated Sparrow in Orange County.—On March 19, 1921, a single White-throated Sparrow (*Zonotrichia albicollis*) appeared in a small flock, made up of about twenty Intermediate Sparrows and a few Golden-crowned Sparrows that frequented a large pile of brush about thirty feet from our house. It was very easy to get a close view of it, from the windows, as it fed most of the time about the back-yard. It was seen nearly every day until April 10, when all of the flock left.—John McB. Robertson, *Buena Park, Orange County, California, May 15, 1921.*

Philadelphia Vireo in Montana.—Saunders' list of the birds of Montana contains no record of the occurrence of the Philadelphia Vireo (*Vireosylva philadelphica*) in the State. A female bird was taken by H. E. Anthony, while collecting in company with the writer, near Johnson Lake, Sheridan County, Montana, on June 3, 1910. This region is rolling prairie, with only a sparse growth of boxelder, elm, and willow along the infrequent streams, and the bird was taken in one of these patches of timber. In spite of the comparatively late date, the bird was undoubtedly a migrant. The specimen is now no. 228,547, U. S. Nat. Mus. (Biological Survey collection).—Edward A. Preble, *Washington, D. C., May 13, 1921.*

Western Bluebird Nesting on the Sea-coast.—The published accounts of the breeding of the Western Bluebird (*Sialia mexicana occidentalis*) on the coastal plain are so few that the following note may be worth recording. There are at this writing (May 15, 1921) at least four pairs of Bluebirds in Carpinteria on the narrow plain that stretches from the last foothill to the ocean, in territory less than 50 feet above sea-level. I have located two of the nests. One is probably as near the ocean as the species is likely to nest. It is in a willow, in the last group of trees between the Coast Highway and the sea, so near a salt marsh that a very high tide would come within 50 rods of the nest.—Ralph Hoffmann, *Carpinteria, California, May 15, 1921.*

EDITORIAL NOTES AND NEWS

The regular *July meeting of the Northern Division of the Cooper* Club will be postponed until Wednesday evening, August 3, 1921. This is done in order to relate the meeting to the sessions of the Pacific Division of the American Association for the Advancement of Science, which will be held at Berkeley, August 4 to 6, 1921. The business meeting of the C. O. C. will be held at 7:30 P. M., and the program will commence at 8 P. M. The two papers thus far assured are: "The Pelican Colonies of Pyramid Lake" by Barton Warren Evermann; "The Principle of Rapid Peering, in Birds" by Joseph Grinnell. Visiting ornithologists will be able to join in the various excursions which are being planned in connection with the general meetings.

Mr. and Mrs. J. Eugene Law are doing vertebrate field work again this summer in the Chiricahua Mountains, southeastern Arizona. Mr. Donald D. McLean is serving as Mr. Law's assistant, and the party keeps in touch with the outside world through the kind offices of our fellow Cooper Club member at Dos Cabezos, Mr. Frank H. Hands.

We are not infrequently called upon to recommend a few of "the best" books on birds for a beginning student to own, said student being of the type who is ambitious to qualify in due time as a serious ornithologist. Of course the number must be strictly limited and the factor of scholarly standards be kept foremost in consideration. Here are the four works we have, on occasion, nominated: Coues' "Key to North American Birds"; Newton's "Dictionary of Birds"; Pycraft's "History of Birds"; Bendire's "Life Histories of North American Birds" (with Bent's continuation of the same so far as it has appeared). Perhaps somone else will have different ideas on this score. We invite comment.

Various interesting bits of news have come to the ears of the Editors lately and some of them we hereby pass along. Mr. Harry Harris, of Kansas City, is reported to be at work upon a biographical index to the *Ibis*. There is also a persistent rumor current to the effect that Missouri is to lose Mr. Harris,—California to be the gainer. Part II of Mr. A. C. Bent's "Life Histories" is in press, and the manuscript of Part III is completed. The Treganzas (Mr. and Mrs. A. O.) are actively promoting popular interest in birds among the boy scouts, clubs, and schools of Salt Lake City. Prof. *Arthur A. Allen, of Ithaca, has had remarkable* success the past spring in rearing broods of Ruffed Grouse. Mr. S. Prentiss Baldwin has recorded further startling revelations this summer concerning the domestic relations of the house wrens on his place near Cleveland. Mr. R. H. Beck is giving a good account of himself among the South Sea islands, whence he has already shipped in to the American Museum of Natural History several consignments of rare bird skins.

PUBLICATIONS REVIEWED

SAUNDERS ON THE BIRDS OF MONTANA.*—This report, the first complete notice of the birds of Montana, consists mainly of an annotated list of all species of recent birds known to have occurred within the State. The main list numbers 332 species and subspecies, including all currently recognized indigenous forms known to occur. Species noticed under secondary headings are as follows: Recently Extinct Species, one (Passenger Pigeon); Introduced Species, four; and Hypothetical List, thirteen, species which have been recorded but the status of which is questioned, owing to possible errors in identification. There is also presented a supplemental list of nine subspecies which have been described but are not generally considered as valid.

We consider this report to be one of the best lists ever prepared for a western State. The allocation of old records, by no means an easy matter, seems to have been exceptionally well done, and the very large amount of field work accomplished by the author places to his credit a much greater proportion of the notes than is usual in such undertakings. Its appearance places the ornithology of Montana on a basis far in advance of similar work in any other of the larger and more sparsely settled States, with the exception of Arizona, and many years are likely to elapse before a more complete exposition of the bird life of the State appears.

The introductory part comprises about twenty-five pages. The introduction proper,

*A Distributional List of the Birds of Montana, with Notes on the Migration and Nesting of the Better Known Species. By Aretas A. Saunders. Pacific Coast Avifauna, No. 14. 194 pages; 1 map and numerous figures. Published by the Cooper Ornithological Club, Berkeley, California, Feb. 1, 1921.

occupying about four pages, relates to the author's own work and the other sources which contributed to the results. We learn that Mr. Saunders spent nearly five years of almost continuous field work, with two additional summers, in various sections of Montana. The main results of much of this work have already appeared from time to time. The author also acknowledges important assistance gained from manuscript reports furnished by a number of ornithologists resident in various parts of the State, some of these representing several years' observation in their respective sections. The more important of these lists and the sections covered are as follows: Bernard Bailey, Bitterroot Valley; A. D. Dubois, Dutton and Belton; Joseph Kittredge, Jr., Missoula and elsewhere; Nelson Lundwall, Gallatin Valley; J. L. Sloanaker, Kalispell and Flathead Lake; Gerald B. Thomas, Billings and Lake Basin; and C. F. Hedges, Miles City. Of these, the last two contributed notes on several forms not otherwise known from the State.

A bibliography is presented listing more than 200 titles, arranged by authors alphabetically, and chronologically under authors. Of the articles cited 33 are by Saunders and 22 by Silloway. Among earlier important works which are omitted from the bibliography may be mentioned the articles by Captain Blakiston on birds collected in the interior of British America, published in the Ibis, 1861-63; and the report by George M. Dawson of the British North American Boundary Commission, 1875. We miss also, both in the bibliography and in the accounts of many species, references from Mrs. F. M. Bailey's annotated list of the birds of Glacier Park, issued by the National Park Service, January 10, 1919. This report contains many detailed notes on nesting and migration not given in the brief list in the circular which is cited.

We regret that the author has failed to include in his introduction accounts of the more important of the early expeditions which traversed the State. Thus the famous journey of Lewis and Clark in 1804-5, during which Montana was crossed on both the outward and homeward trips, resulted in the discovery of three notable species of birds, and of these at least two (Lewis's Woodpecker and Clark's Crow) were first seen in western Montana (though the actual type specimens were taken in Idaho), yet we look in vain for any mention of these important facts, either in the introduction or in the separate accounts of the species.

Similar lack of detailed treatment obtains with reference to *Cyanocitta stelleri annectens*, from Hell Gate River, east of Missoula; *Cyanocephalus cyanocephalus*, from the junction of the Marias and Yellowstone Rivers; *Ammodramus bairdi*, from near Fort Union, situated on the north bank of the Missouri exactly on the line between North Dakota and Montana; *Junco hyemalis montanus*, from Columbia Falls; *Pinicola enucleator montana*, from Bear Creek, Gallatin County; and *Penthestes atricapillus septentrionalis*, from the Yellowstone about 30 miles above its junction with the Missouri. In some of these cases, however, information as to type localities may be found in the annotations in the bibliography. We can hardly blame the author for failing to undertake the drudgery of compiling accounts of these expeditions, although we consider them important in a work of this kind, but surely the fact that the first known specimen of a given species came from the State deserves mention under its proper heading. An examination of the narratives of journeys would also have prevented the inclusion under *Mergus americanus* of the upper Powder River and Deer Creek records, under *Querquedula cyanoptera*, of the Popo Agie River note, and under *Histrionicus histrionicus* of the Trook record, which refers to the Wind River Mountains (see Palmer, *Auk*, xxx, p. 106), all relating to localities well down in Wyoming.

The annotations generally consist, in the case of the commoner species, of a brief summary of the status of the bird in the State, whether permanent resident, summer resident, regular migrant, or casual visitor, together with dates of arrival and departure, notes on nesting, habitat, zonal distribution, and other items of interest. The notes are in the main well selected and to the point. Each species is treated under the scientific name, and usually under the common name, given in the 1910 edition of the A. O. U. Check-List. We note, however, that in some cases vernacular names are used which seem more appropriate than the official A. O. U. names. An example is Eastern Bluebird, instead of Bluebird, for *Sialia sialis*, which seems a reasonable change, "from the standpoint of a resident of Montana, where *Sialia currucoides* is *the* Bluebird." We join the author in the hope that similar changes in the common names of many species will be made in the next edition of the Check-List.

Citation of references is by the popular method of indicating a title in the bibliography by a key reference consisting of the author's name, with date of the article and the page. The care necessary to prevent errors by this method is shown by the fact that in some way the key reference to Coues' report on the birds of the 49th parallel (1878) has been confused with that of an earlier work, with the result that in dozens of cases the notes are wrongly credited to his article in the American Naturalist on the nesting of certain hawks. This error apparently runs through the entire work, with few exceptions.

The accounts of *Empidonax trailli* and *E. alnorum* evidently were not written in the light of the recent studies of Oberholser, which resulted in the former name being shifted to the eastern form, and the consequent renaming of the western species. However, since the nomenclature throughout is understood to be that of the 1910 Check-List, this course is probably the more sensible one. We would suggest that the standard set in other cases would seem to favor placing Krider's Redtail in the Hypothetical List; we also question the advisability of allowing more than one form of the Blue Grouse for the Bighorn Mountains.

The locality, Silver, Missoula County, where a specimen of Vaux's Swift was collected in 1891, is on the St. Regis River a few miles southeast from St. Regis Pass, and is now known as Saltese. The writer has a recollection of hearing of this change of name many years ago, but has been unable to find the name Silver on any available map. This is an example of the great dificulty experienced in locating places the names of which were formerly in common use but which have become obsolete.

The only species which occurs to the present writer as having been taken in Montana and not included in the list is the Philadelphia Vireo, a specimen of which was taken by H. E. Anthony at Johnson Lake, north of Culbertson, Sheridan County, June 3, 1910; it is formally recorded elsewhere in the present issue of THE CONDOR.

Distributional areas are divided into three categories, faunal, zonal, and associational, and as far as we are qualified to judge, the subject is well handled. We are inclined, however, to question the value of mentioning some of the less well-defined associations. Associations seem to furnish a subject so elusive, and yet so alluring, that an author is tempted to indulge in intricate and sometimes tedious discussions to account for the presence of species, when in fact the reason for such presence is self evident or the explanation tells only half the story. An example of the latter kind is the citation of the Northern Pileated Woodpecker (i. e., the eastern form) as a characteristic species of the Yellow Pine Association west of the Continental Divide. This treatment is explained in the main account of the species, and while the subject appears to be conclusively treated from the standpoint of a State list, we are tempted to pursue it further. The Pileated Woodpecker is, as far as we know it, an inhabitant of *heavy forests, either deciduous or evergreen*, wherever they occur in sufficiently large and continuous areas to afford the bird protection and an adequate food supply. The species is thus a resident of the better-developed or better-preserved parts of the eastern forested region from the Atlantic Coast to the Mississippi Valley, and from Florida to southern Canada. The bird is naturally absent from the Great Plains, and where the northern edge of this vast treeless area impinges on the great transcontinental forest, carrying its influence far northward and combining forces with adverse geological and climatic conditions so effectively as almost to bisect that great expanse of woods, as far as really heavy forests are concerned, the ranges of the eastern and western Pileated Woodpeckers are apparently separated (excepting one record) by a space of five hundred miles from Lake Winnipeg to the lower Athabaska River. In the valley of this stream, the fertile soil of which, aided by a climate somewhat tempered by periodic mild trans-montane influences, induces a heavy forest growth, we again meet with this magnificent woodpecker. From this section north to the Liard, and west to the Pacific, its range is practically continuous wherever suitable forests occur, and there is but little interruption. From British Columbia southward, the range of the bird is confined mainly to the country west of the Rocky Mountains, including the area in question in western Montana. Theoretically then, all the birds of this northwestern area should be closely related, and we believe that this is the case and that the individuals living in western Montana and throughout the west Canadian range will be found to be referable to *Phloeotomus pileatus picinus*, if indeed this race, which seems to be but slightly differentiated, be considered worthy of recognition.

The map leaves much to be desired, but taking into consideration the number of things it purports to show, it does well. However, it is a good example of what happens when one attempts to represent the salient features of a great State on a single page. It simply can not be done.

It is to be regretted that the relatively trivial errors and omission which we have indicated should appear in a work of such a generally high standard of excellence, but they should not be construed as reflecting seriously on the results of an undertaking based so largely on original investigation of a high order of merit, and representing an amount of painstaking study which can be fully appreciated only by those who have attempted similar labors.—EDWARD A. PREBLE, *Biological Survey, Washington, D. C., May 13, 1921.*

EVERMANN AND CLARK ON THE FAUNA OF LAKE MAXINKUCKEE.*—"The Birds" occupy a relatively unimportant position in this comprehensive report (pages 481 to 579 of the first volume) as compared with certain other groups of animals or plants, but there is, nevertheless, a great deal that is of interest and value here placed on record regarding the species treated. One hundred and seventy-five species and subspecies are listed (305 are attributed to the entire state in Butler's *Birds of Indiana*), those given in greatest detail being naturally the water birds and those most closely confined to lacustrine or riparian surroundings. The lakes and rivers of northern Indiana in years past formed a veritable hunter's paradise and although the myriads of water fowl have since been sadly reduced in quantity, we can still see in the numbers of species represented at least an indication of former conditions.

The accounts of the birds are written in Dr. Evermann's pleasing and unhackneyed style, with the spirit of the enthusiastic collector cropping out in many places.

Residents of Indiana have available in this report a store of detailed and authentic information pertaining to the natural history of the northern part of the state. Lovers of nature from other sections should derive a great deal of pleasure from the narratives relating to various of the species concerned, even though unfamiliar to the reader. Incidentally it may be suggested that even an ornithologist can find much to enjoy in some sections of the book relating to things other than birds, such as the parts that deal with the reptiles and fishes.—H. S. SWARTH.

*Lake Maxinkuckee, a physical and biological survey. By Barton Warren Evermann and Howard Walton Clark. Published by the Department of Conservation, State of Indiana, 1920. Vol. 1, 660 pp., 32 halftones, 36 colored pls., 23 text-figs., 1 map; vol. 2, 512 pp.

MINUTES OF COOPER CLUB MEETINGS

SOUTHERN DIVISION

FEBRUARY.—The regular meeting of the Cooper Ornithological Club, Southern Division, was held at the Southwest Museum, together with the Bird Lovers' Club, at 8 P. M., February 24, 1921. The special feature of the evening was the exhibition of a large number of excellent lantern slides, mostly of birds and nests, by President Dickey. This entertainment was enjoyed by an enthusiastic audience of some sixty members of the Cooper Club, Bird Lovers' Club, and the Audubon Society.

Followed the business meeting, at which Dr. Miller presided, at the request of President Dickey. Minutes of the January meeting were read and approved, followed by reading of minutes of January meeting of the Northern Division. January membership presentations received favorable action, on motion of Dr. Rich, seconded by Dr. Bishop. New names were: W. B. Purdy, Milford, Mich., by Wright M. Pierce; Mrs. C. E. Raymond, Hinsdale, Ill., and H. H. T. Jackson, Washington, D. C., by W. Lee Chambers; William Warren Moore, Eureka, by John M. Davis; William Rowan, Edmonton, Alberta, Canada, by W. L. Chambers; Walter Cunningham, Kansas City, Mo., by Harry Harris; Dr. Frances Louise Long, Helen S. Nicholson, and Herschel Vincent Hibbard, Tucson, Ariz.; also Mrs. M. F. Musgrave, Phoenix, Ariz., by Charles T. Vorhies.

Dr. Miller announced that Mr. W. L. Finley will exhibit moving pictures of birds at the March meeting of the Club, and extended an invitation to all present to attend that meeting. Informal discussion of bird matters completed the session.—L. E. WYMAN, *Secretary.*

MARCH.—The regular meeting of the Southern Division, Cooper Ornithological Club, was held in the assembly room of the State Exposition Building, Exposition Park, at 8 P. M., March 31, 1921. President Dickey was in the chair, with an audience of 150, among whom were 35 club members.

On proper motion the entertainment feature of the evening preceded the business meeting. This consisted of a lecture, illustrated by wonderful moving pictures of birds and mammals, by Mr. W. L. Finley, and was hugely enjoyed by all persent as being not only entertaining but highly instructive.

Followed a short recess, when formal business was taken up. Minutes of the previous meeting were read and approved, while reading of those of the Northern Division was waived. New presentations were as follows: Mrs. Delpha S. Miller, Glendale, by Loye Miller; Frederick Norman Gallup, Escondido, by C. S. Sharp; Max Walker de Laubenfels, La Grange, Ill., by W. Lee Chambers; Delacourt Kell, Claremont, by Wright M. Pierce. The Northern Division sent the names of Ella B. Drummond, Berkeley; J. W. Winson, Huntington, B. C.; Lionel V. Taylor, Kelowna, B. C.; Kenneth Racey, Vancouver, B. C.; Carroll McGettigan, San Francisco.

The resignation of Mr. Howell as vice-president was tendered and accepted on motion of Dr. Rich, seconded by Mr. Chambers. Nominations of Dr. Rich and Mr. Pierce to fill the vacancy brought the withdrawal of the former; and on motion of Dr. Miller the secretary was instructed to cast a favoring ballot for Mr. Pierce, who was declared elected.

Messrs. Chambers and Miller were named to assist the president in formulating resolutions on the death of John Lewis Childs, on motion of Dr. Miller that the chair appoint a committee of three, including the chairman, for this purpose. A motion by Dr. Miller, seconded by Mr. Little, that the executive committee be designated as the official committee on entertainment, was unanimously carried. Adjourned.—L. E. WYMAN, *Secretary.*

APRIL.—The regular monthly meeting of the Cooper Ornithological Club, Southern Division, was held April 28, 1921, at 8 P. M., at the Museum of History, Science and Art. President Dickey presided. About fifty members and friends attended. The chief feature of the evening was a talk by Dr. L. H. Miller on Notes of Birds. This was amply illustrated by imitations of bird calls and songs, and was thoroughly enjoyed by all present.

Following a brief recess, minutes of the March meeting were read and approved. New applications for membership were: Brasher C. Bacon, Madisonville, Ky., by D. Bernard Bull; Clarence Abram Barnes, Los Angeles, by W. Lee Chambers; and R. W. Limbert, Boise, Idaho, by George Tonkin. A communication from the vice-president of the California Art Club, relative to a contribution by the Cooper Club to a proposed fund to erect a memorial to the late F. S. Daggett, was presented. On motion by Mr. Law, the secretary was instructed to advise the writer that the Cooper Club had no fund available for that purpose, and to transmit the names of individuals who might wish to contribute.

A request, from the Atascadero Chamber of Commerce, for the Club's endorsement of a proposed "bird pageant", was tabled pending further information on the subject, and Mr. Chambers was requested to investigate and report at a later meeting.

The committee on resolutions on the death of Mr. Childs reported as follows:

> Whereas, science, if it is to function fully, must of necessity enroll in its support not only the trained specialist, but, equally, the scientific enthusiast who brings much of his heart, although but part of his time, to its service; and
>
> Whereas, in the passing of the late John Lewis Childs the Cooper Ornithological Club has lost a member who filled that latter niche in Club affairs with peculiar force, who stood always ready to give unstintingly of constructive suggestion or material aid in a degree which only those who piloted the Club through early years can ever fully know, who was at once an inspiration to some of us in student days and later a reliance to some, in furthering our scientific ends, but who was to us all a fellow member who brightened many meetings with a quiet charm we will not soon forget;
>
> Now, therefore, be it resolved, that the Southern Division of this society spread upon its minutes this expression of admiration for his life,—of heart-felt bereavement in his death.

On motion of Dr. Miller, seconded by Mr. Appleton, the report was accepted by a rising vote.

A brief informal discussion of bird matters completed the session. Adjourned.—L. E. WYMAN, *Secretary.*

MAY.—Regular meeting of the Southern Division, Cooper Ornithological Club, was held at 8 P. M., May 26, 1921, at the Museum of History, Science and Art. In the absence of President Dickey, Vice-President Pierce occupied the chair. About thirty members and friends attended.

The formal business meeting was preceded by an address on the "Evolution of the Hawaiian Bird Fauna", by Prof. William Alanson Bryan. Prof. Bryan is an authority on the subject, by virtue of long resi-

dence in those islands and extensive study of their fauna, and his talk was appreciated by all.

Business matters were taken up after a brief intermission. Minutes of the April meeting were read and approved. Minutes of the Northern Division were read by title only. Applications for membership were presented as follows: W. A. Hilton, Claremont, Calif., by Wright M. Pierce; Mrs. G. H. Schneider, by Helen S. Pratt; Wm. Alanson Bryan, Los Angeles Museum, Exposition Park, by L. E. Wyman; Lieut. L. R. Wolfe, 64th U. S. Infantry, Camp Meade, Md., by W. Lee Chambers; Frances Vermilyea Barnes, by W. Lee Chambers; Miss Dorothy K. Austin, Pasadena, Calif., by Miss Ethel K. Crum. The Northern Division sent the names of Miss Florence Van Gassbeek and Charles H. Baker.

A communication from the Secretary of the Pacific Division of the A. A. A. S. relative to the annual meeting was presented and the secretary instructed to acknowledge receipt and advise that the Northern Division would represent the club in the matter of arrangements.

A letter from the Librarian of the Los Angeles Public Library soliciting support at the coming election in the matter of a bond issue for a library building was read and ordered filed. A further communication from the Atascadero Chamber of Commerce relative to endorsement of a proposed bird pageant was considered unsatisfactory, and on motion of Dr. Miller, seconded by Mr. Brown, was likewise ordered filed.

Followed the usual round of informal discussion of bird matters, during which the abnormal bird movement and nesting was generally commented upon and ascribed to the abnormal season. Adjourned.—L. E. Wyman, *Secretary.*

NORTHERN DIVISION

April.—The Northern Division of the Cooper Ornithological Club met at the Museum of Vertebrate Zoology April 28 at 8 P. M. President Wright presided, and the following members were present: Mesdames Allen, Ayer, Bamford, Blake, Boyle, Burk, Drummond, Flinn, Van Gassbeek, Griffin, Grinnell, Mead, Neugass, Pitcher, Reygadas, Roe, Schlesinger, Woodruff; Messrs. Bell, Carriger, Dixon, Evermann, Kellogg, Lastreto, Storer, Swarth, and Wheeler; Visitors, Miss Beaman, Miss Cassidy, Mrs. Evermann, Miss Kellogg, Mrs. Wheeler, and Messrs. Baker, Miller, and Farber.

[The March meeting of the Northern Division was held informally in Golden Gate Park; no business being transacted, there were no minutes filed.]

The February and March minutes of the Southern Division were read. Names proposed were: George R. Field, Requa, Del Norte Co., by Tracy I. Storer; Mrs. Minnie Buhn, Alameda, Miss Dora H. Shinn, San Mateo, and Chas. H. Baker, Oakland, by H. C. Bryant, and Miss Florence Van Gassbeek, Berkeley, by Mrs. Georgia T. Roe.

A letter from the secretary of the Pacific Division of the A. A. A. S. announcing preliminary arrangements of the meeting to be held in Berkeley in August was read by the secretary. It was voted that the president appoint a committee on entertainment to cooperate with the general committee of the University. Mr. Baker presented an offer of a prize to consist of $50 to $100 to be offered for the best essay written by a student in the University on some subject connected with economic ornithology. The secretary was instructed to forward the offer to Dr. Grinnell.

The report of the committee appointed to consider Dr. Bryant's resolution relating to the collecting of specimens, sent in a written report in favor of referring the matter to the Board of Governors. The report was adopted.

Business disposed of, Mr. Robert C. Miller gave a talk on "The Flock Behavior of the Coast Bush-tit". After discussion, the club adjourned.—Amelia S. Allen, *Secretary.*

May.—The Northern Division of the Cooper Ornithological Club met at the Museum of Vertebrate Zoology, Berkeley, May 26, at 8 P. M. President Wright was in the chair, with twenty-one members and visitors in attendance. Minutes of the April meeting were read and approved, and April minutes of the Southern Division were read. Names proposed were: Mr. William Polk Farber, Berkeley, Calif., proposed by Tracy I. Storer; and Mrs. Mildred Tiffany Wood, Hopland, Calif., by Mrs. Eva D. Roe. Mr. Storer reported briefly on a recent article in *The Ibis* by Col. R. Meinertzhagen, upon accurate determination of the velocity of various birds in ordinary and migration flights.

Mr. H. R. Noack presented the paper of the evening, his subject being "Some Experiences with Aviary Birds". A general discussion followed. Adjourned.—Tracy I. Storer, *Secretary pro tem.*

For Sale, Exchange and Want Column.—Any Cooper Club member is entitled to one advertising notice in each issue free. Notices of over ten lines will be charged for at the rate of ten cents per line. For this department, address W. LEE CHAMBERS, *Eagle Rock, Los Angeles County, California.*

STILL LACKING.—Through exchange notice on this page, I have completed my set of the Auk. I still lack Bulletin Nuttall Ornithological Club, vol. 1, no. 2; vol. 2, no. 3. I will pay any reasonable price for a copy of either or both of these numbers.—R. C. MCGREGOR, *Bureau of Science, Manila, P. I.*

WILL EXCHANGE any or all of my natural history collections for a good well-rated automobile. I have: 840 North American and foreign birds, skins and mounted; over 400 sets birds' eggs, catalogued at about $2600 at Taylor's list prices; 7000 specimens, 2000 species, fresh-water and marine shells; about 275 minerals; about 300 fossils; 2000 Indian relics; a 5½-foot mounted alligator. Any one interested notify me as to year, make, condition and equipment of auto offered and ask for detailed list of collections. Or take a run up in the machine, look over the collections, and talk trade. Write first.—H. F. DUPREY, *R. D. 1, Box 78B, Dixon, Calif.*

FOR SALE.—My ornithological library containing complete set of Nuttall Bulletin and Auk, Bird-Lore, Nidiologist; Cory's "Birds of Haiti and San Domingo"; Ridgway's "Birds N. and Mid. Amer."; first edition of Nuttall's "Ornithology"; Coues' Bibliography, complete; etc. Large stock of pamphlets. Parties interested will kindly let me have lists of their wants.—RALPH W. JACKSON, *Route No. 1, Cambridge, Maryland.*

WANTED.—A copy of George N. Lawrence's paper "A Catalogue of the Birds found in Costa Rica", from the Annals of the Lyceum of Natural History of New York, vol. IX, 1874, pp. 86-149.—W. E. CLYDE TODD, *Carnegie Museum, Pittsburgh, Pa.*

TO EXCHANGE.—A limited number of choice and desirable sets of eggs (with nests, where practicable) for first class sets of rare or semi-rare species.—B. S. BOWDISH, *Demarest, N. J.*

WANTED—Ridgway's Birds of N. & M. America, vols. 1 and 2, in original board binding. Offer same volumes in paper, and cash difference. Also want Nidiologist, vol. 1, no. 2. Have for sale or exchange for sets: Bulletin C. O. C., vol. 1, nos. 1, 2, 4, 5; vol. II, complete. Oologist, 1899 to 1921, a few numbers missing. The Crocodiles, Lizards and Snakes of N. A. (paper), Cope. The Dinosaurs (paper), Marsh.—C. S. SHARP, *Escondido, Calif.*